Binding Civil and Civic Infrastructure:
The Need for Transparency and Accountability in Baltimore's Water Crisis

by

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B.Sc. Civil and Environmental Engineering
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Submitted to the Department of Urban Studies and Planning in partial fulfillment of the requirements for the degree of

Master in City Planning

at the

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

JUNE 2018

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Abstract

With declining federal assistance for essential infrastructure upgrades, water and wastewater utilities have increasingly relied on customer revenue to fill funding gaps. This has led most recently to "water crises" in cities such as Baltimore and Detroit, where residents who cannot afford to pay increasing rates have been disconnected from water services altogether. Although utility disconnection is a common practice to collect unpaid revenue, the scale and duration of these shut-offs is unprecedented, and, in both cases, the result of concurrent urban fiscal and social crises. In the absence of legislation that secures the right to water for all American citizens, people addressing the problems have typically tried to identify sources of infrastructure funding that would be more equitable, or calculate levels of payment that are truly affordable. In light of these debates, this thesis asks whether processes of deliberation between the government and the public might serve a critical role in alleviating the problem.

After investigating Baltimore's financial structures and exploring causes of confrontation between the public and the utility, this thesis suggests transparency and accountability reforms that enhance planning processes which involve citizens so Baltimore's DPW can move beyond the practice of just counting meters, to one of seeing and hearing customers. The thesis argues that, short of improving the infrastructure, the processes of citizen engagement, particularly via the collaboration of various state and utility departments, will help improve the technical and financial efficiency of the utility and create greater equity for customers through providing data and records that bolster various processes and programs, from account classification to collection to customer assistance to information about cognate programs such as affordable housing—all of which will make it easier to assess and determine equity. The ultimate goal is to meet the financial and physical needs of water and wastewater utilities, while also addressing issues of equity, with a focus on deliberation and data collection that places an emphasis on process that leads to both desired outcomes.

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Acknowledgments

I owe my deepest gratitude and respect to the guidance and support of a network of advisors and loved ones. Those who humored me by listening to me rant about water infrastructure in America when I thought that I knew it all, those who gently encouraged me when I hit roadblocks, and those who reminded me of my worth, and provided perspective, when the task at hand seemed too big for me to tackle.

To the officials and advocates in Baltimore, who graciously trusted an outsider with their time and opinions, this thesis would not be possible without your input, and I hope it can contribute to your work in the long run.

To my advisor, Gabriella, a sincere thank you, for being an anchor in an otherwise stormy process, and for pushing me to follow my interests instead of settling for pragmatism, while never abandoning it either. I marvel at the support you could grant me, while anchoring so many others at the same time.

To my reader, Shadi, thank you for your invaluable commentary, and for providing a practitioner's perspective on a topic that will require the creativity of diverse opinions to tackle the challenges at hand.

To my unofficial reader, Garnette, thank you for injecting inspiration and authenticity into a writing process that could have otherwise easily fallen flat.

To my closest friends and loved ones from DUSP, your continuous presence, support, passion, and dedication in this journey has resulted in personal growth that will keep shaping my theory of practice and relationships long after we graduate. I hope we can celebrate and weather future storms together.

To my closest friends in far-away places, your virtual presence through phone calls and messages of encouragement and humor got me through some of my toughest points. I am only here because of the paths we shared at one point or another, and for that I will always be grateful.

To my family, from those who are no longer with me, to the newest arrivals, it is impossible to fully acknowledge the support, guidance and love that got me here, in any way that seems adequate. *Aapko mera salaam.*

To the country that formally adopted me this year, thank you for the opportunities you have presented. This thesis was an endeavor in strengthening some of your weaknesses through the value of a different perspective, dedicated work, and honesty.

To the country of my birth, a home, real and imagined, an apology for not being able to work on your behalf at this time but a hope that this endeavor will translate itself into support for the equal progress of all your people in the future.

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Motivations and Positionality

On the morning of June 23rd, 2016, I received an email in my official inbox, declaring that an early leave policy was in effect for the day, and that workers could leave the office anytime they wished. The cause was not weather, as is common in Baltimore, but an impending storm of a different kind. The verdict for police officer Caesar Goodson Jr., charged with second-degree murder and three counts of manslaughter, was to be announced that day. It had been over a year since his involvement in the death of Freddie Gray, but the subsequent protests and demands to address police brutality remained fresh in the city's mind. Our office, Louis Berger, located in downtown Baltimore, was a mere block away from City Hall and police headquarters. Protests and general disorder were predicted for the aftermath of the verdict, perhaps because the verdict itself was predictable. And so most of us packed up our bags for the day and made our ways home, away from downtown, and away from City Hall, a place we would otherwise frequent on a daily or weekly basis when the city called us in for our technical projects regarding water and wastewater. This time, instead of calling us in, the city was telling us to evacuate. This was not our problem.

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Civil and environmental engineers like to claim that we, and the work that we do, is undervalued. This belief is held in part because despite our technical expertise, and despite our knowledge of how to replace and fix the nation's infrastructure, few outside the profession are willing to talk about it, and even fewer are willing to pay for it. This

challenge has led to decades of underinvestment and a build-up of physical deterioration for which the solution is now estimated to cost trillions of dollars. When trying to understand how we got here, three explanations are widely offered: physical invisibility, ease of access, and political paralysis.

In the water and wastewater sector, the majority of hard infrastructure lies beneath the ground, where it was placed decades ago. In a notable publication from 2012, the American Water Works Association (AWWA) argued that most of the nation's drinking water infrastructure had been "buried in the national consciousness" and now that it was reaching the end of its useful life, it could be "buried no longer." The invisibility of water infrastructure is played up outside industry organizations as well, with news reports and articles raising concerns about underground pipes remaining "out of sight, out of mind," leaving their deterioration unnoticed, until they burst and roads are destroyed, properties are flooded, and lives are put at risk.

Ease of access is another major factor that civil and environmental engineers have to contend with in the water sector. Because the systems that treat and distribute water remain invisible, the resource itself becomes an assumed good, readily available but not always appreciated for the social and economic value it generates. As a result, industry organizations are supporting a campaign designed to raise awareness around the "value of water". On the campaign's landing page, this message stands out in bold:

"Essential. Reliable. Invaluable. Water—it's the thread that weaves together our daily lives. It keeps our communities healthy, our cities running, and our economies growing. Water is a cup of coffee, the produce aisle, better production, increased exports, and greater American strength. While essential, water infrastructure is largely invisible. Few people realize what it takes to treat and deliver drinking water every day or how wastewater is cleaned so that it can be safely reused or returned to the environment. The high quality of life we enjoy in America would not be possible without water and the infrastructure that fuels it."

The campaign also commissioned a report to quantify the "economic benefits of investing in water infrastructure" and found that investments in water would generate 1.3 million jobs over a 10-year period, and result in $220 billion dollars in total economic activity to the country. While the returns might sound attractive, the price tag of the investment is now well over $1 trillion by some estimates.

Having studied, worked, and been raised in a context which some might call "developing," I find the U.S.'s relationship with drinking water not only surprising, but concerning. The continuous availability of fresh, clean, water is taken for granted, and even when people appreciate its presence, they have difficulty quantifying its benefits.

To add to the problem, the highest levels of government have been unable to respond with an effective, comprehensive solution. While both political parties agree that the issue must be addressed, Congress seems unable to chart a course forward. In response, the American

Society of Civil Engineers (ASCE) has placed the following call on its website: "We need your help to get Congress and state legislatures to take action on the things that matter most to civil engineers."

For those wondering what things matter most to civil engineers, ASCE offers the following: civil engineers serve as planners, designers, constructors and operators of the built environment, the ultimate economic and social engine of society. In short, issues that matter to civil engineers, should matter to all people. For the two years that I practiced engineering, this remained a point of pride. I could not imagine then, that in another two years, I might be asking a different kind of question: when should issues that matter to all people, matter to all civil engineers?

***

In January 2018, I sat down with Bill Henry, a Councilmember of Baltimore's 4th district. I had requested a meeting with him to discuss issues of water affordability in the city, the subject of a research project called "American Water Shutoffs" led by faculty members in my department at MIT, where I was completing a Master's degree in City Planning. My transition from engineering to planning had been driven by the desire to understand and contend with the sociopolitical structures that produced obstacles for delivering basic services like water and sanitation. Although I was studying developing contexts, the research project caught my interest as a way to understand the issues I had witnessed while working as a consulting engineer with water utilities in the DC metro region.

Motivated by the Flint crisis and news of water disconnections or "shutoffs" in cities including Detroit and Baltimore, our group's research aimed "to develop financially sustainable and socially equitable solutions" that made water affordable for all urban residents in cities facing financial distress and infrastructure failure. I looked forward to speaking with members of the Department of Public Works (DPW) in Baltimore, to understand their struggles, as much as the struggles that urban residents were facing with rising water costs.

Members of the utility proved difficult to get in touch with. Given the political sensitivity of the issue, and the slew of recent articles in the Baltimore Sun painting DPW in a less than favorable light, their hesitance to speak about the issue was unsurprising and unfortunate. Faced with that limitation, I reached out to an advocacy organization that had most prominently, and most recently, been organizing around the issue: Food and Water Watch (FWW). Although a national organization, FWW has city chapters dedicated to issues within their geographies. The Baltimore chapter had commissioned and released a report on "Baltimore's Water Conundrum" in November 2017, prepared by Roger Colton, a legal expert in the world of affordable utility financing. After speaking with him, I was connected with other advocates on the ground who had organized themselves as the "Baltimore Right to Water Coalition." They, in turn, led me to City Councilmembers and State Legislators with whom they had been meeting to address the problem.

By the time I met with Councilman Henry, a number of advocates had already drawn a very clear conclusion for me: DPW cared more about the physical system, than about the people it served. As a researcher, I knew that I had only heard one side of the story, and as an engineer, I wanted to give the benefit of doubt to the utility. The story could not be that simple. Therefore, when I met with the Councilman, I wanted to understand how he saw the problem, given that he was not constrained to this single issue, and his mandate was to serve his constituents. I prompted him about how access to affordable water related to the larger "cloud" of issues that people were facing. Although I immediately regretted the choice of that word on my part, I would come to appreciate it when, in response, he made a gesture, then leaned down and spoke directly into the phone that he had agreed to be recorded upon. Doing my job for me, he recited his own actions into the microphone:

"Mr. Henry waved his arms and hands around in a large gesture, implying that the cloud was very big."

Intentional or not, his amusing reaction quietly subverted the interview before it had even begun, and reminded me of my role and responsibility. Baltimore is not a stranger to outsiders who assume that first and foremost, it is a dysfunctional city, and I was not the first one who had come around looking for answers and solutions to my own assumptions.

While being an outsider presented its challenges and limitations, it also presented opportunities for comparative learning. Anyone from a developing country is likely to find stark contrasts between the apolitical approach to infrastructure in the U.S., and the

approach practiced abroad. Whereas the World Bank and other development organizations would be quick to study human capacity, institutional strength, and political upheaval as significant challenges to successful implementation of infrastructure systems abroad, infrastructure in the 21st century has become a purely technical, or at most, a financial issue to be contended with in the U.S., with concerns of equity largely invisible in the mainstream.

It is in that context that I interpreted my research Baltimore, and within which I formulated the question that is discussed further in this thesis.

Chapter I: Introduction

Two weeks before Freddie Gray's arrest, the Baltimore Sun ran a headline that received little to no national attention:

"Baltimore to send water turn-off notices to 25,000 delinquent customers" (Broadwater 2015a)

The few who took notice outside of Baltimore were those who had fought a similar issue in Detroit a year earlier. In reality, shut offs, or disconnections, are a common utility practice to recover money from customers for unpaid bills. The indignation that followed this news in both Detroit and Baltimore had less to do with the existence of the practice, and more to do with perceptions of fairness around it, given the economic distress that both cities were in.

But in Baltimore, economic distress would not be discussed until after Freddie Gray. Mark Levine, a historian and Professor of Urban Studies at the University of Wisconsin-Milwaukee, wrote an article in the aftermath of Freddie Gray's death, claiming that it was a grim reminder of the racial inequality and socio-economic distress that remains "entrenched in America's inner city neighborhoods" (Levine 2015). More than a decade earlier, Levine had authored a chapter in a book on the social sustainability of cities entitled "A Third-World City in the First World: Social Exclusion, Racial Inequality, and Sustainable Development in Baltimore" (Levine 2000). Two years before the first episode

of “The Wire” aired on HBO and catapulted the “boarded up, post-apocalyptic neighborhoods” of Baltimore into the homes and imaginations of millions of Americans, Levine’s chapter explored Baltimore’s dynamic history as both a “renaissance” city, and an “underclass city,” and the policies and changes that led to both designations.

The title for his chapter was inspired by a 1994 USAID Program called “Lessons without Borders” which aimed to bring ‘Third World’ development techniques to American inner cities, which were facing major social and economic stress. At that time, U.S. policy makers drew parallels between Baltimore’s social conditions, and the conditions of those in developing countries. Indicators for social conditions included drug addiction, of which 9% of Baltimore’s population was suffering in 1996, high infant mortality rates, with Baltimore ranking third in the U.S., and high crime rates, for which Baltimore was the second highest amongst the nation’s largest cities (Levine 2000).

Fifteen years after his book, Levine claimed that the causes of the social conditions he had written about back in 2000 had still not been successfully reversed. In a way, he was unsurprised, as any city would struggle to reverse decades of economic decline, suburbanization, and racial segregation. In terms of economic decline, since the 1970’s, the city has lost over 80,000 jobs, which is over one-fifth of its employment base (Levine 2015). Deindustrialization has led to the disappearance of manufacturing jobs, like those offered by Bethlehem Steel, a plant that at its peak, offered 35,000 jobs to city residents. By comparison, the total number of factory jobs in the city today is 11,000. Although jobs in downtown Baltimore have increased, the majority of these jobs have gone to suburban

commuters. Meanwhile, employment in city neighborhoods has declined by almost 50% since 1970 (Levine 2015).

The commuters that have taken many of the newer, higher skilled jobs in the city, have benefited from decades of suburbanization that aided in eroding the city's financial base. After 1950, the city's population declined continuously, falling over 30% below its peak by 1997. Population in the suburbs grew from just below 400,000 in 1950 to over 1.8 million in 1997 (Levine 2000).

The process of suburbanization, largely driven by departure of white residents, also known as 'white flight,' impacted the racial composition of the city dramatically. Baltimore was a black-majority city by 1970, and by 1997, two-thirds of the population was black (Levine 2000), which is how it has remained until today ("Data & Demographics" 2016). Indicators demonstrate a disproportionate impact of economic distress on black residents of the city, as 44% of black male residents between the ages of 25-54 remain unemployed. Given the city's history with red-lining and housing segregation, poverty and unemployment remain spatially concentrated within particular neighborhoods (Levine 2015). In a way, the public image cultivated through statistics like these has made Baltimore a poster child for the country's racial tensions, with little understanding about the conditions that people live in, and even less discussion of the institutional mechanisms that have led to such issues. This disconnect between the spectacle of violence and the causes of distress has allowed city governments to continue operating in silos, unable to see the links between different processes like water shut offs and economic development.

This disconnect is reflected in the types of language used by public officials and advocates, with the former justifying practices like disconnections, by saying that customers need to pay their "fair share," and the latter arguing that economically distressed cities have large swaths of people who cannot afford to pay, and do not deserve to be penalized for this inability (Broadwater 2015a). While legal rulings can bridge divides, a study in response to the Detroit shut offs found that access to safe and affordable water currently fell short of a constitutional right in the United States, but could be legislated and protected under the right to life in the future (Murthy 2016).

Neither state nor federal legislatures seem to be moving in that direction. In the absence of such legislation, the problem of affordability and access to water can become a negotiation between local governments that provide water, and those who use it and pay for it. Local governments in turn, look to utilities who operate and manage the highly technical systems that provide water to the public. Although negotiations around water have taken place between the public and the government in the past, the nature of the problem this time around presents challenges to the public's ability to pursue the problem purely through avenues of negotiation between residents and the government.

In older U.S. cities like Baltimore, systems that provide water and sanitation services were originally built in the late 1800s or early 1900s (Melosi 2000; Boone 2003). Since then, contemporary negotiations around water in the United States primarily concerned quality, spurred by public health concerns over the pollution of public water bodies due to the

dumping of growing industrial waste. Conversations around quality of water in the 60s and 70s led to the passage of legislation like the Clean Water Act and the Safe Drinking Water Act. With mandates from above, engineers turned to their specializations and developed technologies that could treat water to the degree that was mandated. In the late 90s and early 2000s, the public and the government deliberated yet again over the quality of water, when cases of lead exposure came to light (Melosi 2000; Edwards, Triantafyllidou, and Best 2009). Even the most recent case of negotiation in Flint, Michigan, was over the quality of drinking water that people were receiving in their pipes (Butler, Scammell, and Benson 2016).

Although problems of quality can be connected to problems of aging infrastructure, the nature of the problem in Baltimore and Detroit is different because quality of drinking water does not come into the picture at all. Instead, the conversation is purely around lack of access to drinking water, driven by financial pressures that have been passed down from the utility to the customer. In other words, the negotiation is not about level of toxin exposure or treatment that would reduce public health hazards, but rather the level of water rates and source of capital payments for aging infrastructure and increasingly stringent regulatory requirements, in a context of larger economic distress at the household and city level, like Baltimore, where 23% of the population fall below the poverty level ("Data & Demographics" 2016).

The raising of water rates is not unique to Baltimore, but a national trend (Craley and Noyes 2013; Espinola 2017). In many ways, utilities are simply doubling down on years of

economic literature which justify user fees in exchange for benefits, such as water and sanitation services. Furthermore, many operators argue that water and wastewater rates have been historically lower than necessary, which has increased the existing gap between capital needs and sources of revenue.

What Baltimore and Detroit demonstrate, however, is that certain portions of the population might be more vulnerable to rising rates and deteriorating infrastructure. And when economically distressed and historically marginalized communities face increasing financial pressure over "constitutive" or basic rights, it leads to suspicions regarding whose interests are ultimately being served or prioritized.

The question of interests is further amplified with financial experts looking to fill the infrastructure gap with private sources of capital. Interest of private capital in infrastructure can be seen everywhere from financial consultant reports, to investment portfolios. Deloitte has released a report on the role of public-private partnerships (Eggers and Dovey n.d.). Citibank sponsored a report on the wealth of public assets (Boyle 2018). Goldman Sachs, Morgan Stanley, and Black Rock have established infrastructure funds, backed by investors that include the likes of Saudi Arabia (Merle 2017). Finally, the recently released federal infrastructure plan supports these calls and strategies for private participation (The White House 2018).

This transition to international infrastructure capital, supports the splintering of metropolitan areas and is very likely to exacerbate uneven development of urban

infrastructure, or increase underinvestment and neglect of marginal populations (Graham and Marvin 2001). Furthermore, some argue that the nature and scale of financialization make it a deeply undemocratic practice, which the water sector needs to address before contemplating the use of new, seemingly easier sources of capital (Ahlers and Merme 2016). Finally, prior experiences in the solid waste and water sectors continue to draw concerns regarding cost inefficiencies of private capital (Bel and Warner 2008). Despite the debates, financial struggles remain a reality for both utilities and customers.

Problem Statement

Rather than trying to identify which sources of capital would be most equitable, or calculate what levels of payment are truly affordable, this thesis asks the question of whether processes of deliberation between the government and an increasingly distrustful public might serve a role in answering these questions. The ultimate goal is to meet the financial and physical needs of water and wastewater utilities, while also addressing issues of equity, but the focus on deliberation places an emphasis on the process, in the hopes that it leads to both desired outcomes.

The rest of this chapter provides an overview of the ideal of deliberative democracy, and both classic and reformulated methods of deliberation that work towards the ideal. I then move on to discuss the history of Baltimore's water and wastewater systems, to demonstrate how deliberation due to equity concerns and diverging political and fiscal interests impacted the origin of both.

The next chapter, chapter II, presents a financial overview of Baltimore's Department of Public Works (DPW). It analyzes DPW's current financial performance, the sources of its revenue, and the drivers behind its increasing costs. Chapter III begins to look at DPW's response to increasing financial pressure, and the ways in which that pressure is passed on to customers. Chapter IV evaluates resident, advocate, and local government responses to increasing financial pressures, and demonstrates growing distrust between citizens and the government. Chapter V looks at potentialities for improvement by analyzing the redemption of another city utility in the region: DC Water. DC Water used deliberative mechanisms like transparency and accountability as a way to package recommendations for the utility, and I explore the implications of this approach for Baltimore and for future research aiming to resolve the water infrastructure crisis in American cities.

Deliberative Democracy

While deliberation can be broadly defined as communication that uses non coercive methods to reflect on preferences and interests, democratic deliberation involves a decision binding on the participants, and those who the participants represent. All democratic deliberation aims to "inspire transformations in the direction of the common good" (Mansbridge et al. 2010). In the classic ideal, deliberation is based on reason and the authority of the better argument about a common concern. However, this excludes self-interest and all forms of negotiation. Contemporary theory moves away from deliberation based purely on reason, to deliberation based on mutual justification which opens the door for storytelling or other forms of "non-cognitive evocations of meaning and symbols" to appeal to shared experiences (Mansbridge et al. 2010). Not all deliberation attempts to end

in consensus, but rather aims to structure and clarify conflict well, such that participants can end with non-deliberative democratic mechanisms. Mansbridge et a. (2010) argue that the reformulation of democratic deliberative ideal should include non-coercive forms of negotiation.

They also argue that some non-deliberative mechanisms that employ coercive power are necessary to democracy as long as they can withstand deliberative scrutiny. Voting is an example of this. Although voting is defined as a use of coercive power, it is justified because it makes self-government possible, but in the democratic ideal, each vote must be equal. There cannot be vote-buying through money or an exchange of goods and services to specific individuals.

Still, there can be cases where the use of a coercive power like voting is less justified. For instance, in a context where a society is deeply segmented, and important issues cluster together, the minority on one issue is likely to be the minority on another issue. In such cases of "permanent minorities," majority-rule voting is less fair than other forms of decision-making that generate more proportional outcomes.

For Mansbridge, forms of deliberation lie on the following spectrum:

1) **Convergence**: Deliberation concludes with participants agreeing on a single outcome for the same reasons, but begins without significant conflicts of opinion or

interest. Deliberation to convergence often generates mutual respect, trust, collective agency, satisfaction, and goodwill

2) **Incompletely theorized agreements**: Originates with conflicting agreements but ends with participants agreeing on the same outcome for different reasons.
3) **Integrative negotiation**: Similar to incompletely theorized agreements in that they originate with conflict and end with one outcome for different reasons, but in this case, differences are out of self-interest, including material interest.
4) **Fully cooperative distributive negotiation**: Originates with conflict and parties reach an agreement by giving up part of what they wanted, after deliberation on conflicting interests and principles of fairness.

Finally, the reformulation of deliberative theory underlies the importance of identifying self-interest in deliberative conversations, with the understanding that if self-interest is not part of the process, the group will likely adopt a version of the common good that does not take everyone's interests into account and misrepresents what's really at stake. When dealing with concerns of human rights, expression of self-interest should serve as information, rather than justification (Mansbridge et al. 2010).

Using these ideas of deliberative democracy, the rest of this thesis analyzes the role of deliberation in solving Baltimore's modern day water crisis.

Methodology

This thesis analyses Baltimore's water crisis through the lens of the city government, the utility that it operates, and the people that it serves. Federal and state interventions in the city are considered where relevant, especially in terms of financial assistance. However, absolute numbers of financial assistance in the forms of loans and grants are challenging to determine, given that the only source for this information would be Maryland's state audits which are thousands of pages in length each year. While state-specific information is fragmented and difficult to determine, the Congressional Budget Office (CBO) provides data on federal contributions to water and wastewater infrastructure, which is presented to provide context for the city's finances.

The majority of the analysis to determine the city's financial condition is sourced from the city's own financial documents that are all publicly available, including:

- City of Baltimore Comprehensive Annual Financial Reports (CAFR) (2013 – 2017)
- DPW Annual Reports (2014 – 2017)
- City of Baltimore Open Budget

It should be noted that while the City of Baltimore's Department of Audits produces individual audits for the water utility fund and the wastewater utility fund, the type of information produced by these reports closely matched the city CAFRs. City CAFRs were chosen for the analysis because they also provide financial information for the stormwater utility fund which was started in 2014 and for which no individual audit reports are available online.

The period of time for which the analysis was done, includes the last five years. Five year increments are suggested by the University of North Carolina's Environmental Finance Center (UNC EFC), which provides tools to help researchers and officials study the financial health of their utilities. Since the shutoff problem reached its peak in 2015, the period of 2013-2017 gives an overview of the condition prior to, and following the crisis.

The financial analysis provides evidence for the utility's increasing financial struggles, after which the thesis turns to look at the utility's response to financial pressures, including what had been made public through the shutoff crisis. I combined the research that I had begun under MIT's American Water Shutoffs project, with additional research that I conducted on my own based on what I had learnt from a conversation with Kim Grove, DPW's Chief Compliance Officer. Ms. Grove indicated that the utility had reformed their planning processes, and was continuing to look for alternative sources of capital, to ease the burden on ratepayers. In light of that information, I present and analyze the following:

- DPW's new "Integrated Planning Framework," based on a paper published by DPW Director Rudy Chow.
- DPW's lobbying efforts at the federal level, based on transcripts of Rudy Chow's testimony provided at a Senate Hearing on Water Affordability in 2016
- DPW's rate increases, based on Board of Estimates Meeting Minutes which are available online, starting from 2010, and billing data from a public information request.

- DPW's collection efforts, based on responses to a public information request submitted on behalf of the MIT American Water Shutoffs projects in January 2018.

The public information request and its response are attached as appendices to this thesis. Data was requested for the period between 2012 and 2017, to understand any trends prior to, and after, the publicized shut-offs in 2015. The third chapter discusses limitations of this data at length, particularly data regarding DPW's collection processes. Ideally, the data would have revealed how much money DPW recoups through both processes, and how many people are impacted by these efforts. Where DPW made data available, such as numbers of properties impacted by tax sales due to unpaid water bills, these numbers were compared to the total number of annual tax sales conducted by the city in order to understand the scale of DPW's actions in comparison to the city as a whole. Total tax sale data was collected from BidBaltimore, which is a public auction site where certificates are placed for sale. While this website provides information on the value and address of each individual certificate that is placed for sale, it does not indicate what the total value of the certificate is made up of i.e. whether the value is due to property tax debt or water debt. Because of this, it is impossible to know the number of properties that are listed for tax sale due to water bills only. The difference between the number of properties that are listed, as seen by BidBaltimore data, versus sold, as provided by DPW, offers an idea of how much the city collects from home-owners before properties are sold to investors, and how many residents are displaced due to inability to pay. The numbers that DPW provides represent the properties that are sold due to tax sale, which could be a smaller subset of the ones that are listed.

Because data is scarce, validating the data proves difficult. To ensure that I understood the tax sale data properly, I spoke with Margaret Henn, a pro-bono attorney in Baltimore, and Michael O'Leary, the Tax Sales Coordinator for the Department of Housing. To understand the shut off process, I relied on the Abel Foundation's report titled "Keeping the Water On" and the Department's internal standard operating procedures, which were acquired and shared by Food and Water Watch. While the Baltimore Sun has occasionally reported numbers on shut offs, particularly during 2015, data received directly from DPW was considered more valid than estimates in the news.

The second half of this thesis focuses on understanding how citizens, advocates and city officials view DPW's responses to rising financial pressures. Transcripts and videos from the Baltimore City Council Hearing in October 2016, and the Board of Estimates Hearing in August 2016 provided access to testimony from 41 members of the public. Of this group, 10 people represented some type of advocacy organization, while the rest are residents of the city.

Recognizing the limits of public hearing testimony, this thesis does not argue that this information alone provides a complete picture of resident opinion throughout the city, but rather, that public testimony is an opportunity to highlight some of the causes behind discontent between the public and DPW. Since members of DPW were present at both of these hearings, they also provide an opportunity to understand how DPW responds to citizen concerns.

Ideally, this information would be coupled with interviews that are conducted on the ground, outside of the public hearings, to understand citizen motivations for appearing and publicly testifying. Unfortunately, due to limited time, this was outside the scope of this thesis, but should be considered in the methodology for future research.

Furthermore, the thesis lacks interviews with DPW's director and members of the executive team. Although I made efforts to contact them via email and phone call, I did not receive a response. Interviews with utility officials would have shed important light on how the utility perceives their relationship with customers, and whether they are attempting to address citizen concerns regarding affordability and other issues.

While I could not conduct interviews with residents for this thesis, I was able to speak with advocates and city officials. Roger Colton, a consultant who has worked with Food and Water Watch (FWW) connected me to FWW advocates on the ground in Baltimore who further recommended that I speak with Councilman Bill Henry and State Delegate Mary Washington. Outside of these recommendations, I was also able to speak with Councilman Zeke Cohen, who provided a different opinion on the water crisis, since he was newly elected to the city council and had not been involved as long as Councilman Henry who has been active in Baltimore's civic affairs for over twenty years.

Again, since the methodology for these interviews was more exploratory, the thesis does not argue that these are the only opinions or perceptions that exist, but rather strives to understand why each of these individuals has the opinions that they do.

The final chapter of this thesis presents a short case of a neighboring utility, DC Water, to provide some context for DPW's performance. Information on DC Water was obtained entirely through documentation that DC Water makes available online. The documents that were chosen for analysis include meeting minutes from committee meetings within the utility that discuss issues of customer affordability and customer service since 2009. Future research could expand on this case by looking more closely at how DC Water customers perceive the utility's actions.

Overall, the methodology for this thesis has been a combination of exploring qualitative and quantitative data to understand how DPW came to be in its current position of financial hardship, and how that hardship has been impacting customers, such that recommendations could be devised around making the relationship between DPW and the residents of Baltimore collaborative rather than confrontational.

Chapter II: The Origins of Baltimore's Water and Wastewater Systems

While the history of water and wastewater infrastructure in Baltimore is not altogether dissimilar from the overall national experience, understanding the political justifications and decisions that led to the city's current predicament requires an overview of the city's particular historical experiences with financing and building the networks that exist today, and how citizens played a role in that history.

Since the beginning of its incorporation, the city has had to deal with political, economic, and financial issues that pose barriers to the implementation of basic service provision. Matthew Crenson's recent book, "Baltimore – A Political History," traces this history clearly, starting with issues of water supply in the late 1700s. Starting with its incorporation in 1796, the Baltimore city council formed a committee to contend with water shortages and supply in the city. Although a technically feasible solution existed, the city ran into legal hurdles because it lacked the power of eminent domain, and property owners did not provide permission to lay water pipes on private property. As the issue was lobbied back and forth between city council and the Mayor, private citizens with an interest in solving the issue gathered at a public meeting to devise a solution. The outcome of this meeting was a joint stock company in the water business with "local notables" serving on the board of directors. In 1804, they began receiving subscriptions for stock in the newly formed Baltimore Water Company (Crenson 2017).

At this time, water was not the only public service that was being provided through private means. The city relied on volunteer fire fighters and private hospitals to supply other critical public needs. Crenson (2017) suggests that in general, the city avoided large-scale, long-term public investments, due to a driving belief of dealing with "present necessities" first.

After a while however, the Baltimore Water Company demonstrated the shortcomings of private enterprise in the water business, extending service only to those who could afford to pay. While the city's population was close to 80,000 in 1825, only 1,640 households paid for water. In addition, the Company acted negligently by failing to meet agreed upon conditions with the city, such as re-paving streets after laying pipes. Around 1835, the City considered buying the company to solve its problems, but the Mayor worried that the city's large stock debt due to railroad investments did not allow it to take on any more financial burden. In took another two decades before the city bought the Baltimore Water Company in 1854, adding $1.35 million to its municipal debt (Crenson 2017).

Once the company was bought out, the city faced the task of overcoming its deficiencies against increasing public discontent. Citizens designed a petition and collected 1,300 signatures complaining about "the long delay on the part of the city authorities to obey the people of Baltimore to introduce an addition supply of Water into the city." With this public push, the water board submitted requests to sell more municipal stock in order to finance the purchase of land and water rights needed to increase water supply (Crenson 2017).

The question of sewers and sanitation also arose due to issues with water supply. As the population grew and the city contended with consecutive summer droughts between 1860 and 1870, there was no longer "sufficient" water to flush out gutters into the docks and harbor as was previously practiced, leading to pungent stenches and odors (Crenson 2017). While some Baltimoreans had the vision of creating a citywide sewer system, Baltimore lacked the political integration necessary to build it, relying instead on partial solutions at the neighborhood scale. The debate on sewers was largely around whether to dump untreated sewage into the Chesapeake Bay, or to filter the sewage through sandy soils in neighboring Anne Arundel County. The former plan was cheaper, but many believed that it would harm the oyster beds in the Bay, and cause other public health concerns. While the majority of members on the city council were ready to follow the sewer commission's suggestion of dumping the waste in the bay, public outcry forced them to reconsider, but instead of forging an alternate path, little progress was made to change the status quo. Although the city received an offer from a private company to finance and construct a sewer system in 1899, Baltimoreans swiftly opposed the plan based on the experience they had had with private infrastructure in the past, particularly streetcars and water, and it eventually came to end due to a procedural mistake (Boone 2003).

By 1900, although every other big city already had a sewer system, Baltimore still relied on cesspools and neighborhood sewers. While the arrival of "reform boss" Mayor Hayes in 1901 indicated potential progress as the city came together to promote one plan (Crenson 2017), politics once again stalled the issue, this time at the state level as Republicans and Democrats in the Senate and House fought to represent competing interests. As Boone

writes, “Baltimore was again the victim of party politics conducted in a city far from its boundaries, a source of frustration for citizens and city leaders” (Boone 2003, 162).

It took a devastating fire in 1904 to bring all players into alignment, as the city’s outlook on large, comprehensive works changed. In 1911, the State General Assembly permitted the city to borrow $13 million to complete a comprehensive system with treatment of wastes before dumping into the Chesapeake. The fire not only rallied citizens around a common cause to rebuild the city better, but also that property assessments increased after the fire, allowing municipal debt to be paid off by the time expenditures would be highest for sewer construction (Boone 2003).

The political history of both the water and the sewer system did not end with the initial build out. The systems required continual work, sometimes related to expansion, and oftentimes related to improving the quality of the water source. For instance, in the 1920s, Mayor Broening took on the task of raising money to pay for an extension of the water system by winning voter approval for four bond issues. He ran a promotional campaign that included a parade of 10,000 adults and schoolchildren in support of the bonds and previews of films at local theaters in silent support after which the loans were overwhelmingly approved (Crenson 2017).

Beyond occasional extensions however, infrastructure did not present a major challenge again until urbanization patterns began to change between 1945 and 1970, and then fiscal crises exacerbated issues with infrastructure maintenance and replacement (Melosi 2000).

The next section goes beyond Baltimore, to describe how these national trends impacted water and wastewater utility systems everywhere.

A Brief History of "Crisis"

The historian Martin Melosi argues that the period between 1945-1970 saw a new kind of "water crisis in an effluent society," whereby systems began to demonstrate signs of decline, water usage increased with the availability of new appliances like washing machines and dishwashers in many middle-class homes, and urban expansion meant the simultaneous expansion of water systems, and therefore an increase in expenditures yet again. The value of constructing new water systems increased nationally from $97 million in 1945 to $3 billion in 1968[1]. Meanwhile, expenditures for water revenues began outstripping revenues (Melosi 2000).

Distribution of water supply contributed significantly to the problem, because water facilities were located in central cities but had to start serving larger metropolitan areas or outlying suburban communities which grew most significantly during this period. Costs of extension were often high because of lower population densities, and users in the suburbs had to be charged more to cover costs. City officials argued that raising sewer rates in the suburbs was justified because core residents had borne the initial costs of building the system (Melosi 2000).

[1] Melosi 2000 does not make clear whether these dollar terms are in real or nominal values.

An interesting twist in this history occurred when, in 1970, HUD began offering water and sewer grants to communities that were willing to accept subsidized housing, in response to allegations of segregated residential patterns in several cities. However, suburbs showed little interest in the program because the grants carried "disagreeable conditions" (Melosi 2000).

While Melosi does not delve further into these conditions, Lamb (2005) describes this intersection of racial dynamics and infrastructure provision in greater detail. In a discussion on the general opposition to suburban integration in post 1960 America, Lamb describes how the Housing and Urban Development Act of 1970 was actually amended such that HUD could not withhold funds for water and sewer provision from suburbs refusing to provide low and middle-income housing (Lamb 2005).

Concerns of equity persisted in other ways as well, as demonstrated by a notable lawsuit in 1971: Hawkins v. Shaw. In the lawsuit, black citizens of Shaw, Mississippi, brought evidence which demonstrated discrimination in public service provision, particularly water and sewer service. Their evidence rested on two facts: lack of sewer service for 20% of black families versus 1% of white families, and smaller sized water mains in black neighborhoods versus white neighborhoods (1.25 versus 6 inches). The second fact contributed to a number of consequences including low water pressure, and therefore higher fire insurance because water to fight fires was not readily available. Although dismissed initially, the Appeals court ruled in favor of the citizens, claiming that there was no "rational" explanation for the outcome (Melosi 2000; Troesken 2004).

In addition to issues with expanding and replacing distribution systems, there were also concerns over water quality and pollution, leading to the Water Pollution Control Act in 1948, and eventually, the Water Quality Act in 1965. In 1968, the Federal Water Pollution Control Administration estimated that it would cost more than $23 billion to build and maintain waste-treatment facilities. The growing environmental movement led to the establishment of a new federal agency, the Environmental Protection Agency (EPA) and the disbursement of more federal funding. Even with a significant increase in federal aid through grants, there was still a significant gap, especially for older cities, as most funds were expended in communities with less than 25,000 in population (Melosi 2000).

With growing complexity in metropolitan growth, deepening urban fiscal problems, and environmental concerns, the 1980s saw the rise of another looming "infrastructure crisis."

Fiscal problems facing cities, were in many cases structural. Federal and state governments mandated that cities perform a wide array of functions, while concentration of poor people at the core raised the cost of providing many public services because of increasing and competing costs of public welfare, health care and hospitals, and decreasing general revenue sources with the continuation of white flight. Also, because core cities were older than suburbs, the cost of maintaining or replacing existing infrastructure was higher. City residents also had to finance services that benefited non-residents, especially commuters (Melosi 2000).

Cities began to rely more heavily on federal aid. The Housing and Community Development Act of 1974 consolidated several programs including urban renewal and water and sewer facilities into single block grants, allows local official discretion in spending federal money. However, most of this aid ended up being sent to suburban jurisdictions who qualified for revenue sharing with cities due to mechanisms like special district administrations, deepening the schism between suburbs and central cities (Melosi 2000).

By the 80s however, Reagan's incoming federal administration significantly cut federal aid to cities. This was the same time that a book "America in Ruins: The Decaying Infrastructure," ignited a wide-scale debate over the nation's public works and future needs. Federal studies followed, the first of which indicated that America's infrastructure suffered from "disinvestment" in basic public facilities ranging from $500 million to $3 trillion. Later studies refined these projections, claiming that infrastructure problems were both "specific and localized," but that the general trend was that many systems were in significant disrepair and that the task ahead was formidable but not impossible, if appropriate funds could be identified (Melosi 2000).

While local conditions impacted the operation and performance of water supply systems, water issues tended to be defined in technical terms by experts "operating in all allegedly apolitical agencies that faced little public review." Melosi (2000) attributes this to rising urban service professionalism, including within the area of civil and environmental engineering. The belief that water and wastewater infrastructure problems were purely technical, lead to mainstream discussions of where to find new sources of finance to pay for

these technical issues. Yet, a study from 1984 presents evidence that reduced infrastructure spending infrastructure during the 70s and 80s was not only due to lack of availability of funds, but perhaps more-so a result of economic and budget decisions made by public officials and voters, who did not understand the consequences of deferring repairs to infrastructure systems (Peterson 1984).

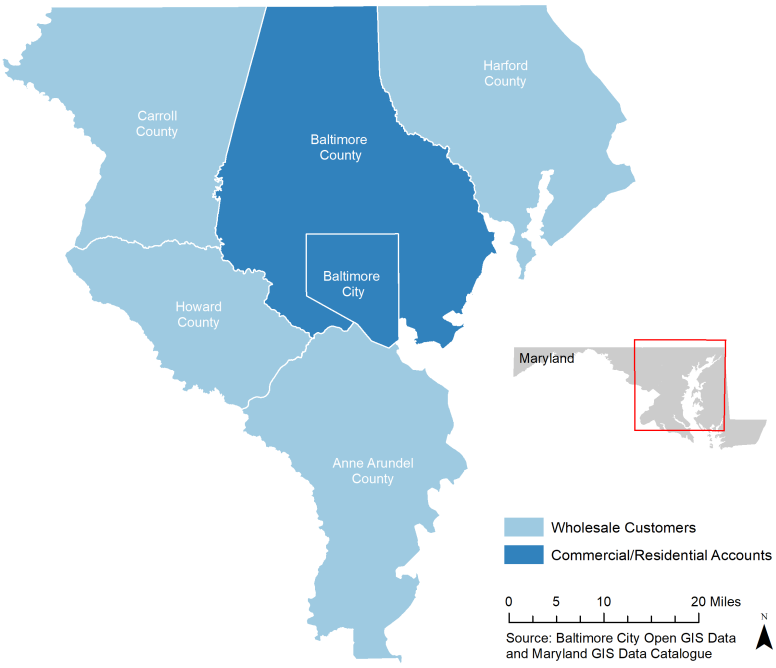
These arguments ring true today, more than ever, as utility operators and city officials lament the legacy of these public spending decisions, and argue for greater infrastructure spending on the justification that they can no longer kick the can down the road.

Chapter III: Building Financial Pressure

Baltimore's Department of Public Works: Present Day

Due to the nature of municipalities and counties in Maryland, there are only two large water and wastewater operators in the state: The Baltimore Department of Public Works (DPW) and the Washington Suburban Sanitary Commission (WSSC). Both of these utilities serve approximately 1.8 million customers each in the larger DC-Baltimore metro region. WSSC's customers live in the two counties that border Washington D.C: Montgomery County, and Prince George's County. Baltimore's Department of Public Works serves customers in Baltimore City and Baltimore County, in addition to selling wholesale water to four other counties (see Figure 1 below).

Figure 1: Baltimore Department of Public Works Service Area



Over the course of its history, the utility has undergone multiple permutations as responsibilities have been added and removed from its original charter. Although established in 1925 as the Department of Public Works, the present administrative structure of this Department was actually formed in 1968, when it was divided into functional bureaus ("Baltimore City Archives (Department of Public Works) 1794-1977 BRG47" n.d.).

Today, the Department consists of two bureaus: The Bureau of Water and Wastewater, and the Bureau of Solid Waste. The bureaus are DPW's service providers; providing the drinking water, providing the trash collection, and providing wastewater collection and treatment. In 2014, the department underwent organizational changes such that, in addition to the two bureaus, cross-functional offices were set up to report directly to the DPW director. These included Asset Management, Engineering and Construction, and Compliance and Laboratories. DPW also created the office of Fiscal Management in the latter part of 2015 to provide oversight of DPW's revenue and expenditures. This office is in charge of DPW's operating and capital budgets, rates and financial forecasting, capital project financing, and procurement and inter-jurisdictional cost-sharing agreements. Prior to 2015, DPW administration, Water and Wastewater, and Solid Waste each had their own office of fiscal management (DPW 2015a, 2016a).

As seen in the service map above, DPW's service area is approximately 220 square miles and includes Baltimore City, and parts of Baltimore, Anne Arundel, Carroll, Howard, and

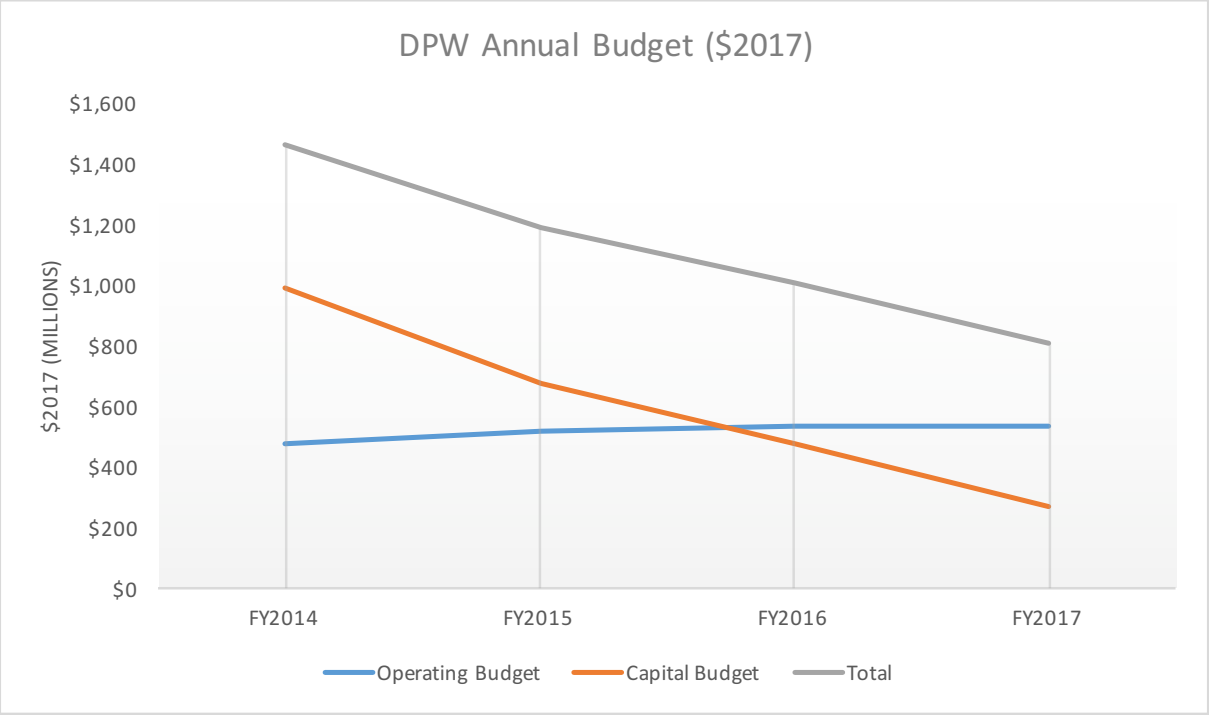
Harford Counties. The water utility treats over 360 million gallons of water per day through three water filtration plants (Montebello I and II, and Ashburton), and distributes it to about 1.8 million people. The utility also manages three raw-water reservoirs: Liberty, Lock Raven, and Pretty Boy, which, when full, cumulatively contain about 80 billion gallons of water (DPW 2015f). DPW also manages two wastewater treatment plants: Back River Wastewater Treatment Plant, and Patapsco Wastewater Treatment Plant (DPW 2015d).

In addition to treatment and storage facilities, the Bureau of water and wastewater also maintains a vast distribution network of pipelines that includes approximately 4500 miles of water mains, and 3100 miles of sewer mains (DPW 2015e, 2015d).

DPW Budget

The Department's annual budget is divided into operating and capital costs. Operating costs support day to day activities, and include administrative costs, while the capital budget is meant to support expenses that relate to the construction or acquisition of new assets. The graph below provides a look at the whole Department's approved budget over the last five years, including both Bureaus. Overall, DPW's budget has decreased, mainly due to decreases in the capital budget.

Figure 2: DPW Annual Budget FY2014 – FY 2017 (DPW 2015a, 2016a, 2017a, 2018a)



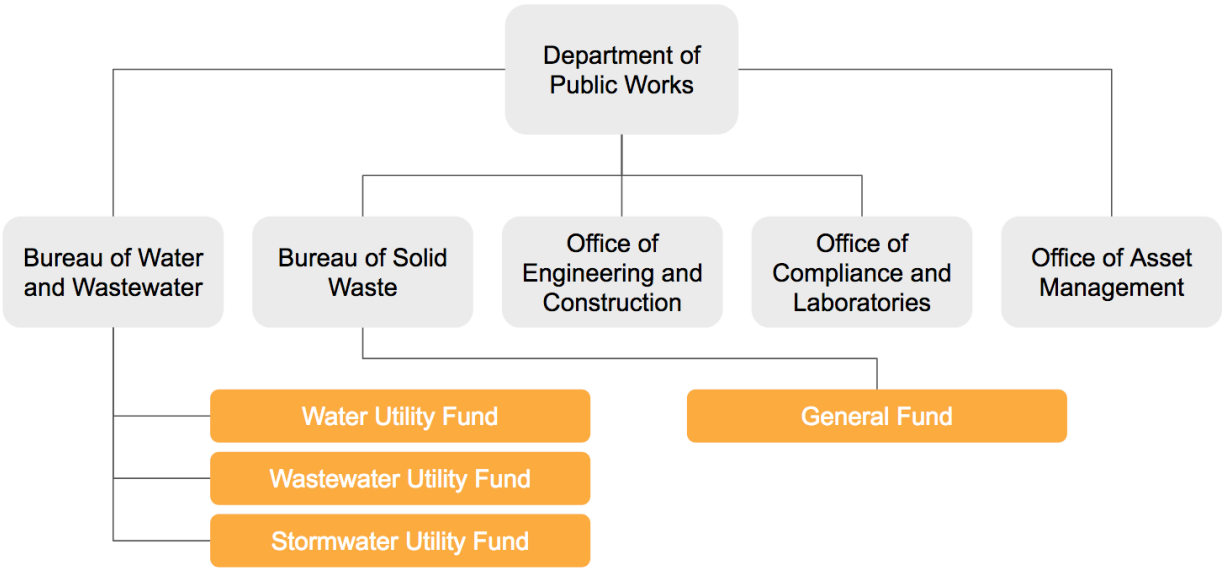
According to the City of Baltimore's Budget, DPW's operating budget takes up the largest share of the overall city operating budget, about 20% out of $2.76 billion, followed closely by the operating budget for the Baltimore Police Department (about 17%) (Office of Mayor 2017).

Enterprise Funds

Services provided by the Bureau of Solid Waste are supported by the City's General Fund, whereas the Bureau of Water and Wastewater is supported by three enterprise funds. This was the result of a Charter amendment approved by voters in November 1978. In Article VI, Section 18 of the Charter of Baltimore, the City established the water and wastewater utilities as separate enterprises to be self-sustaining and operated without profit or loss to

the other funds or programs of the City ("Rates & Fees Overview" 2015). The stormwater utility was added as a third enterprise fund more recently in 2014.

Figure 3: DPW Organizational Structure and Enterprise Funds (Office of the Director 2018; "CAFR" 2017)



The table below provides a breakdown of DPW's operating budget between 2013 and 2017. The water and wastewater utility funds make up the largest share of the operating budget, while state and federal spending often make up less than one percent. Unfortunately, the City's open budget website, from which the data below is obtained, does not provide a similar breakdown of funds for the Department's annual capital budget.

Table 1: Percentage of Contribution DPW's Operating Budget by Fund (Office of Mayor 2017)

	2013	2014	2015	2016	2017
Water Utility	38.1%	42.0%	43.5%	45.0%	44.5%
Waste Water Utility	49.3%	49.3%	53.8%	58.2%	61.6%
Stormwater Utility	0%	5.7%	4.3%	5.0%	5.3%
State	0%	3.9%	3.4%	0.6%	0.2%
Federal	0.4%	0.8%	0.8%	0.9%	0.4%
Special	0%	0%	0.2%	1.4%	0.1%
Internal Service	0.4%	0.5%	0.6%	0.6%	0.6%
General Fund	18.7%	16.3%	17.2%	18.4%	18.7%

User Fees

Since the City's water, wastewater, and stormwater funds are set up as enterprises, or "business type activities," charges for services (also known as user fees), represent the principal revenue source for the funds.

Payment

DPW collects fees from its customers in Baltimore City and Baltimore County. Although DPW provides services to other counties, it does not handle the collection of fees from individual accounts within those counties. Instead, the Department receives lump-sum amounts from County governments based on inter-jurisdictional agreements for the amount each county will be charged, based on the amount of services provided.

For customers within Baltimore city and Baltimore county, the Baltimore City Code establishes property owners as the ultimate party responsible for payment of water bills,

and establishes that all charges (including fees, interest, and penalties) shall be a lien upon the property of an owner, and recorded in the Tax Lien Records ("Baltimore City Code Article 24" n.d.).

Although cities like New York, Philadelphia, and Detroit also place water and sewer bills under property liens, it is unclear whether these cities allow properties to enter into tax sale processes for unpaid water bills only, which is a practice that Baltimore has utilized for many years (Cwiek n.d.; "Overview of the Sheriff Sale Process" n.d.; "Tax Lien Sale NYC: What Homeowners Need to Know" 2018). The challenges created by this process are described further in detail in chapter three.

Billing and Collection

DPW is in charge of sending out bills to individual accounts, and the Department of Finance is in charge of collecting bills for water used, or work done by DPW. According to City Code, all bills have to be paid 20 days after they have been issued, and in the case of default, DPW may cut off water supply to a customer. Internal standard operating procedures differ slightly from the Code, indicating that DPW considers an account "delinquent" and eligible for shut off if a water charge remains unpaid for more than 30 days, and is greater than $250 (DPW 2015b).

Delinquent bills also begin to accrue penalty charges, at a rate of 1.64% of the service charge, and are forwarded as "arrearages" on subsequent bills. Even if a customer misses

one payment, but pays all subsequent payments, arrearages can count as sufficient reason for discontinuing or shutting off water service ("Baltimore City Code Article 24" n.d.).

Rate Setting and Increases

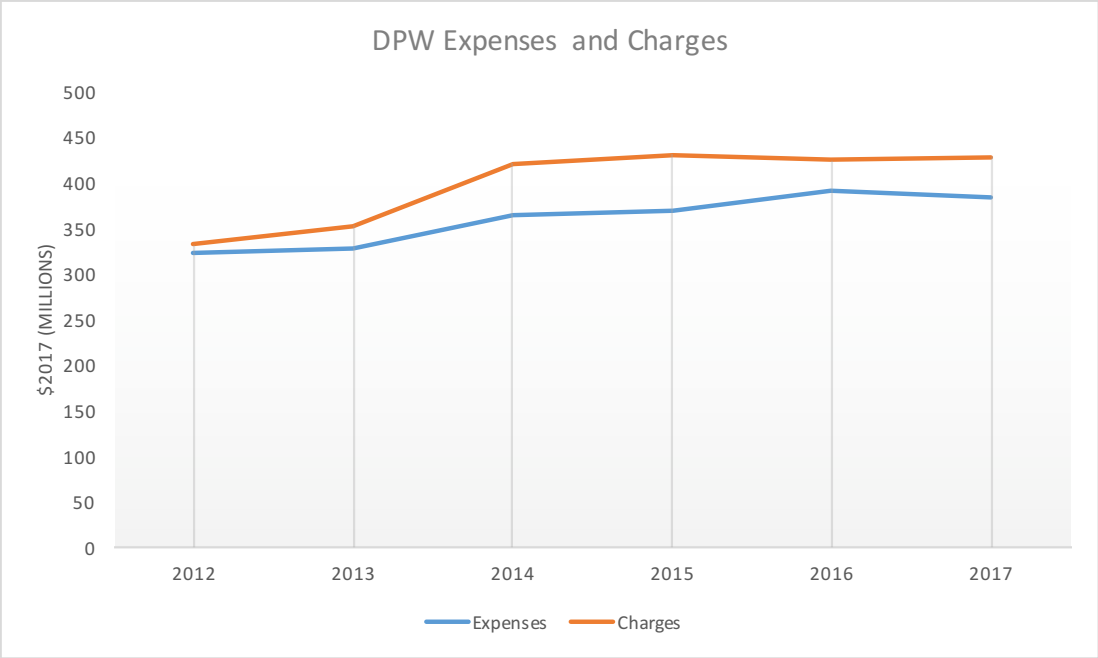
The Board of Estimates (BOE) is the governing body that establishes, assesses, and changes the rates and charges for water and wastewater services, based on the recommendations of the Director of Finance and the Director of Public Works ("Baltimore City Code Article 24" n.d.). According to the city's Comprehensive Annual Financial Reports, the BOE is the highest level decision making authority, in charge of formulating and executing all fiscal policy for the city, including awarding contracts, and supervising all purchasing by the City. It consists of five voting members: The Mayor, President of the City Council, the Comptroller, the City Solicitor, and the Director of Public Works. The President of the City Council serves as the President of the Board, and the Comptroller serves as Secretary ("Board of Estimates" 2015).

Each year, the Board adopts an Ordinance of Estimates, and presents it to the city council. The Ordinance of Estimates includes any changes to water and wastewater rates, among other fiscal decisions. At least 30 days prior to the adoption of any ordinance, a public notice period is required, during which City Council members and the public can make recommendations regarding the proposed changes ("Baltimore City Code Article 24" n.d.).

Revenues Versus Expenses

As seen in the graph below, collected user fees have been covering the department's annual expenses, and meeting the mandate for all three utility funds to be "self-sufficient."

Figure 4: DPW Expenses and Charges from FY2012 – FY 2017 [2] ("CAFR" 2012-2017)



However, given that user fees are being set to cover all expenses, it is important to recognize the breakdown of these costs and how they have been changing. Expenses can be broken down into operating expenses, and debt-service, where debt-service consists of principal and interest payments on long-term debt. The table below shows how DPW's debt service payments have increased significantly since 2013.

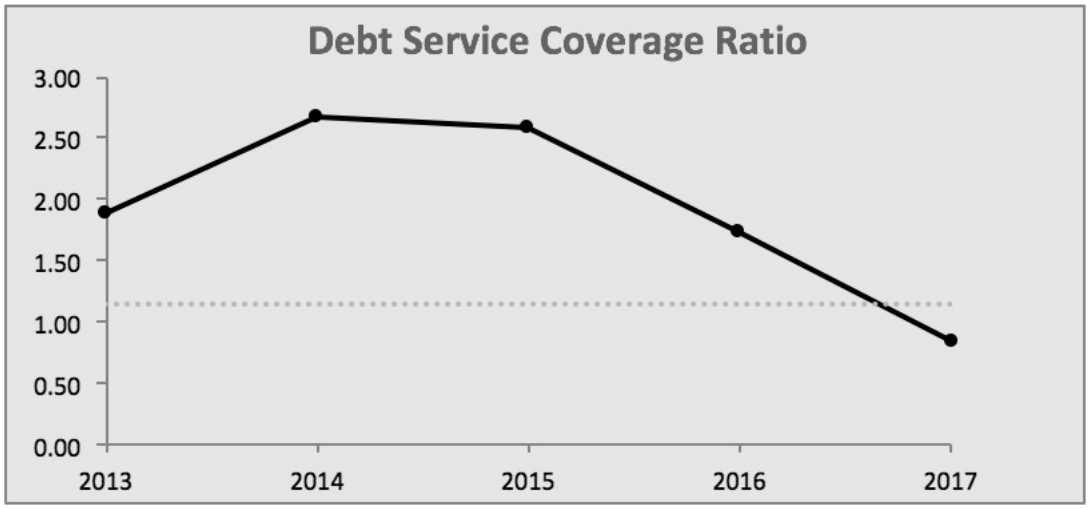
[2] Charges include revenue from capital grants and contributions. Expenses are not broken down by category and are assumed to include expenses for capital outlays and debt.

Table 2: DPW Debt Service Payments for FY2013- FY2017 ("CAFR" 2013-2017)

Fiscal Year	Debt Service Payments ('000s)
2013	$59,341
2014	$58,331
2015	$65,956
2016	$94,056
2017	$191,609

The debt-service coverage ratio (DSCR) serves as a useful indicator to understand whether a system is able to cover its debt-service after paying off its day-to-day operations. The ratio compares the relative magnitude of net revenues (after paying operating expenses) to debt service payments. So in Baltimore's case, even though the department has been able to cover both expenses, a closer look at these expenses over the last five years shows a declining DSCR, or in other words, demonstrates that a higher percentage of revenues is being directed towards paying off long-term debt.

Figure 5: DPW's Debt Service Coverage Ratio for FY2013 – FY2017[3] ("CAFR" 2013-2017)



During a conversation with Kim Grove, the Chief Compliance Officer at DPW, she mentioned the challenge that this poses on the utility, since directing revenue towards debt-service implies that the utility is unable to use revenue for new investments, and has to continue taking out loans, further entrenching the agency's reliance on long-term debt.

Baltimore's increasing reliance on debt is similar to the condition of many other public water and wastewater utilities in the country, and is a result of both increasing costs, and changes in federal and state funding. The history of both of these is discussed in the following sections.

[3] This graph originated from a Financial Health Tool provided by the UNC Environmental Finance Center to assess the financial condition of a water system. The inputs for this calculation are from the City's CAFRs, specifically from the Statement of Net Position, Changes in Net Position, and Cash Flows. The dotted line in this graph represents a DSCR of 1.2, which many rate covenants state as the minimum requirement underlying the ability of an agency or a city to issue a bond. It is unclear why DPW's DSCR is below 1 for 2017, given that Figure 4 shows that charges are greater than expenses. However, the numbers in figure 4 are from a different table within the CAFR. This table is a summary of business-type activities, which "are presented after adjustment to reflect the consolidation of internal service fund activities related to enterprise funds" (CAFR 2017, Pg. 10).

Increasing Costs

There are two major drivers that are running up costs for DPW: age and regulation.

Aging Systems

Like many other old cities in the country, Baltimore can no longer ignore the pressures of age on its infrastructure systems. Compared to other infrastructure like roads and bridges, water and sanitation systems tend to suffer even more, given that their physical deterioration is buried underground, invisible, until a main finally collapses or bursts, causing sink holes and floods above ground.

Even though most of these systems were built to be useful for up to 50 years, in Baltimore, water and sewer mains are at least 75 years old on average, with some sections of the system well over 100 years in age. In addition to pipes which make up much of the distribution system, assets above ground, like water and wastewater treatment plants, have also reached the end of their useful life, with parts that need to be repaired or replaced immediately (DPW 2015a).

Consequences of an aging system have been appearing in Baltimore for the last decade. DPW estimates that 1000 water main breaks occur each year (DPW 2016c). Some breaks are larger than others, leading to major disruptions and high costs. In 2016, the city suffered two major road collapses in April and July on Centre and Mulberry street respectively, due to separate failures along the same sewer main that was over 100 years old. These caused road closures and traffic disruptions for weeks, as crews worked to

repair the system. A 2016 article from the Baltimore Sun estimated that repairs for both collapses would cost DPW a combined $10 million (Campbell 2016).

When a third spot began to appear on the same line along another major street in October, DPW crews responded immediately. However, since sewer mains are installed below other buried infrastructure, just getting to the line posed a construction challenge in itself and required detouring traffic, pumping sewage through bypass lines, and rerouting other utilities including water mains. When the contractors finished, 1.2 miles of the sewer main had been renewed by building a new pipe inside the older pipe, and the project cost $20 million (DPW 2018a).

Similarly, in May 2016, a major 54-inch water transmission line, located underneath a highway exit, began showing signs of rupture. The signs were detected thanks to asset management technology that had been implemented by the department in the early 2000s, on a line that originally dates back to 1970. Repairing the pipe involved excavation of the distressed portion, and the installation of high-strength, post-tension cables around the circumference of the pipe to restore its strength (DPW 2018a).

These experiences highlight the pressure that aging systems place on a utility, and the complexity of rehabilitating or repairing the system. However, while bursting pipes cause major damage, disruption, and cost, an aging system also poses more silent threats. With age, pipes begin to leak water, which causes wastage of a natural resource, and wastage of financial resources, as the utility is unable to recoup revenue from the water they are

delivering through the system. Latest reports claim that Baltimore's system is losing 35% of the water that it delivers (Reutter 2018). In comparison, WSSC, a neighboring utility of equivalent size, loses only 17% of its water. This is based on a water audit report that WSSC is required to submit to the Maryland Department of the Environment as part of the Maryland Water Conservation Act (MDE 2015). Interestingly, Baltimore is not required to report its water losses to MDE, since the report is a condition for receiving a "Water Appropriation and Use Permit" from which the City of Baltimore is statutorily exempt (MDE 2015). Rather than a water audit, DPW's loss estimates from 2018 became public due to financial audits of the system. The Department has been chastised for high rates of water losses before, but continues to miss its target rate of 25%. After the 2018 audit, DPW officials responded to Council questions about water losses by citing issues with aging pipes, in addition to the metering system (Reutter 2018).

Leaks, collapses, and other emergency incidents, will continue to drive up costs for the utility until it can replace or rehabilitate the majority of its treatment and distribution systems.

Regulatory Pressures: The Consent Decree

In 2002, the City voluntarily entered into a Consent Decree to rehabilitate its sanitary sewer and address sewer overflows (SSOs). The Consent Decree is one of many that the U.S. Department of Justice has negotiated with major cities with aging sewer infrastructures. The 2002 Consent Decree expired on January 1, 2016, with the city failing to meet the deadline ("CAFR" 2017).

At the beginning of 2016, an NPR reporter Tom Pelton, sat down with Dana Cooper, DPW's chief of Legal and Regulatory affairs to understand why Baltimore failed to meet the 2016 deadline. Their conversation exposed some of the challenges that the agency faced, including the fact that at the time the decree was originally mandated, the agency did not have complete maps of the system and was unaware about the conditions of its pipes underground. This, coupled with the consequences of little proactive maintenance in the past, meant that the majority of the agency's time went into first mapping, assessing, and inspecting the sewer system, before it could determine next steps to address the issue of overflows (Pelton 2016).

One of the discoveries from this initial assessment period resulted in what would come to be known as the Headworks project. Under the original Consent Decree, DPW engineers discovered a misaligned pipe at the head of the Back River Wastewater Treatment plant which had reduced the volume of sewage that could drain into the treatment plant by almost half of the designed capacity, causing sewage to back up for about 10 miles. While engineers estimated that fixing this single issue could reduce up to 80% of total sewer overflows in the city, the project required more time than the original Consent Decree permitted (DPW 2017a).

After months of negotiations, state and federal regulators filed a Modified Consent Decree which gave the City another chance at remaking its sewer system, now with a deadline of 2021. The City also has to increase the capacity of its sewer system in order to meet "real

world conditions" during a second phase that runs through 2030 (DPW 2017a). Although it is unclear what "real world" conditions mean, it is possible that it could be referring to more stringent design standards. For instance, the 2016 NPR report described how EPA had rejected DPW's initial designs for sewer pipe upgrades that were meant to handle 2-year rainstorms, desiring for the utility to be able to handle 10-year rainstorms instead (Pelton 2016).

In addition to technical requirements, the modified Consent Decree also requires public reporting, including an annual forum, to discuss progress on the Consent Decree. EPA Regional Administrator Shawn M. Garvin called Baltimore's modified Consent Decree "the best path forward to eliminating sanitary sewer overflows, while also providing greater transparency." And MDE Secretary Ben Grumbles said the "mandate for clean water and public accountability means less sewage in basements, streets, and waterways and more progress for the Chesapeake Bay" (DPW 2017a).

By the end of 2016, DPW had already spent about $900 million on Consent Decree projects, and estimated that spending on remaining work could exceed another $1.2 billion (DPW 2017a).

Other regulatory requirements and spending needs

The Consent Decree described above falls under the Clean Water Act, and makes up a large portion of the Department's current capital project portfolio. In addition to Clean Water Act regulations, DPW is also mandated to meet federal and state requirements for stormwater

and drinking water projects, which fall under the Safe Drinking Water Act (Grove 2018). For instance, under this act, DPW is required to better protect its drinking water reservoirs and by 2014, DPW had finished constructing enclosed tanks at 2 out of 3 locations (DPW 2015a).

Due to the large volume of work required under the Consent Decree, DPW dedicated a majority of its financial resources to rehabilitating its sewer system. Between 2002 and 2015, 68% of its Capital Improvement Plan (CIP) had been dedicated to wastewater projects while only 32% had been dedicated to water projects. Given the aging of both systems, DPW officials are now finding it necessary to make up for the lost time and disinvestment by increasing spending on water projects over the next 15 years (DPW 2016b).

In 2014, DPW began an accelerated program to rehabilitate 4000 miles of underground water infrastructure, at a rate of 40 miles per year, about 1% of the total system every year which is recommended by the EPA. Using technological advancements like acoustic sensors, combined with visual inspections, the department committed to working smarter, and addressing the weakest spots first (DPW 2015a). This accelerated program also came up in a Board of Estimates Meeting when a representative of DPW, Mr. Jay Price, cited that the department had increased its annual water main upgrade target from 5 miles of new main each year, to 15 (BOE 2010). It is unclear why the 2014 and 2016 estimates are different, but regardless, this accelerated program has come with a large price tag, as the table below demonstrates.

Table 3: Planned spending between 2016 and 2034 (DPW 2016b)[4]:

Water Fund	$2.53 billion
Wastewater Fund	$1.43 billion
Stormwater Fund	$545 million

It is important to note that while planned spending is driven by regulatory and technical requirements, DPW often faces unplanned costs as well. For instance, increasingly erratic weather patterns in the last few years have cost the department millions. 2014 and 2015 were two of the coldest winters in the City's memory, leading to breaks and disruptions in water service. In 2014, DPW crews responded to more than 300 water main breaks, and in 2015, DPW had to respond to over 6000 no-water complaints due to frozen pipes (DPW 2015a, 2016a).

In addition to costly weather events, the department is also challenged by the fact that it is located in a dense regional area. A presentation from DPW in 2016 indicated that Baltimore often experiences project delays and contractor capacity limitations due to planned spending of over $3.5 billion by mid-Atlantic utilities on projects over the next decade. Competition with other jurisdictions for these services drives up contractor costs and limits the rate at which the utility can complete work (DPW 2016b; Grove 2018).

[4] The presentation does not make clear whether these costs are for capital projects only, or if they include operating expenses as well.

Given the financial pressures summarized above, the next section takes a look at what options are most readily available to utilities like DPW to finance these increasing costs today, as well as a look at how these options came to be what they are.

Financing Options: Federal and State Funding

Increasing costs, decreasing assistance

The utility began to recognize the need to replace aging infrastructure in the early 2000s, which was the same time that it was transitioning from a financing model which relied more heavily on federal assistance, to one that relied much more heavily on user fees (Grove 2018). This shift is explored in the following sections.

Federal spending as a proportion of state and local spending

Currently, the federal government contributes very little to the needs of water utilities. According to a Congressional Budget Office (CBO) report from 2015, federal spending makes up a tiny proportion (4%) of total spending on water utilities, which was around $109 billion in 2014 (CBO 2015). Historically, the case has not been much more different. As seen in the graph below, Federal spending has always made up a small proportion of total public spending on transportation and water infrastructure. Within this small proportion, the majority of federal spending is targeted towards capital expenditures, even though in absolute terms, state and local governments spend more on operations and maintenance.

Figure 6: Federal vs. State and Local Spending on Water Utilities, 1956-2014 (CBO 2015, Exhibit 19)

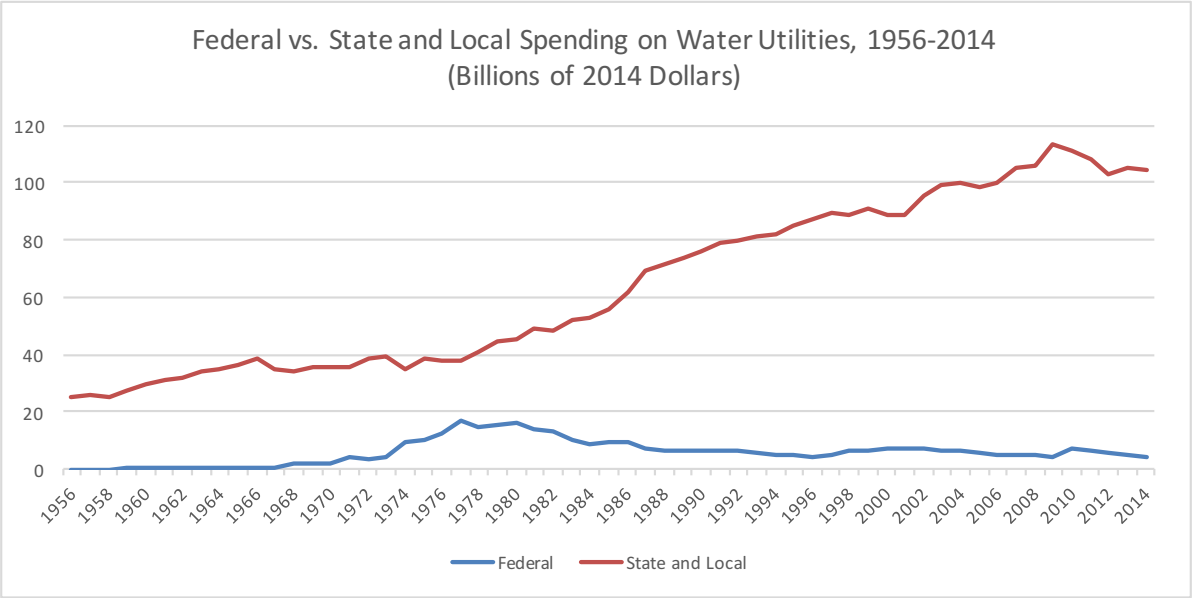
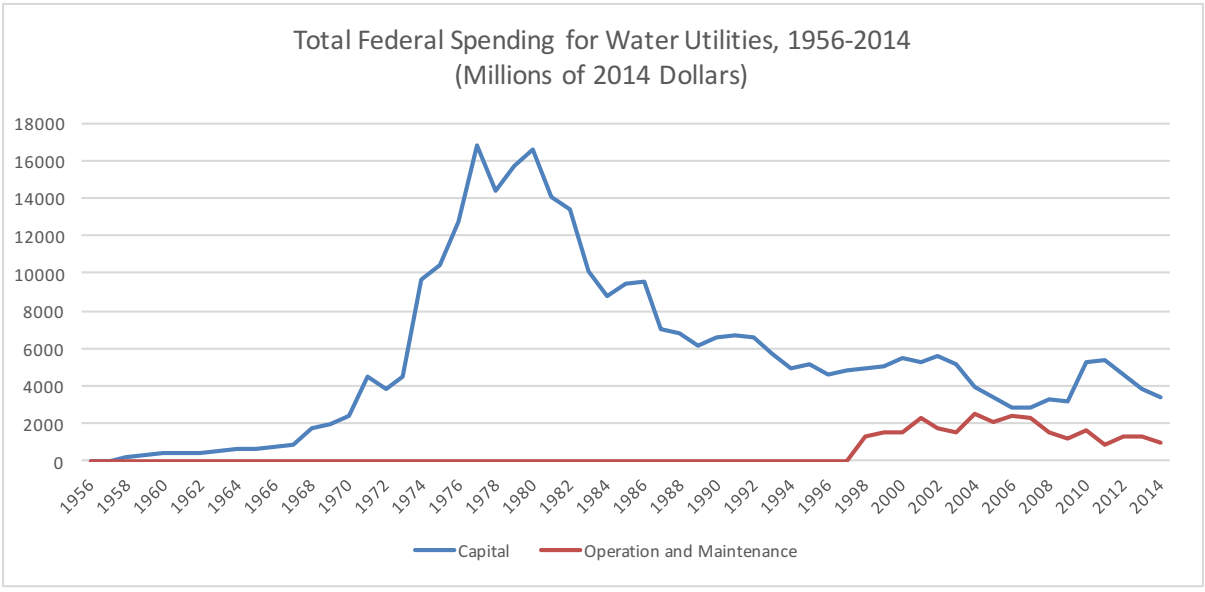


Figure 7: Total Federal Spending for Water Utilities, 1956-2014 (CBO 2015, Supplemental Tables W-8)



The most recent increase in federal assistance came during the nineties due to a push from amendments to the Clean Water Act (Grove 2018). This is reflected in the CBO report on

Public Spending on Transportation and Water Infrastructure between 1956 and 2014, from which the figures above are derived. Since the 50s, increased spending on water infrastructure has been correlated with changes in federal and state regulations. Figures 6 and 7 show that federal spending on water utilities was the highest in the 70s, after the passing of the original Clean Water Act (CBO 2015). The same graph also reflects Grove's statements that there was an increase in capital spending in the 90s, leading up to the new millennium. This second spike corresponds with the amendments to the Clean Water Act (known as the Water Quality Act of 1987) which authorized $18 billion in spending over nine years for the construction of new wastewater treatment facilities to meet mandatory secondary treatment of wastewater (Copeland 2012). The third spike around 2009 represents spending that took place after the American Recovery and Reinvestment Act was passed by President Obama in light of the recession in order to spur spending through construction projects. This act provided $4 billion for CWA SRF capitalization grants and $2 billion for SDWA SRF Capitalization Grants (Copeland 2012).

Apart from the small push that the stimulus provided, since the early 2000s, federal spending on transportation and water infrastructure has generally leveled off as a percentage of total federal spending, or decreased in absolute terms, even though infrastructure needs have been increasing.

Loans are the New Grants: SRFs

In addition to authorizing new spending, the Water Quality Act of 1987 also replaced the mode of spending from traditional federal grant programs for water infrastructure, with

grants to capitalize state clean water loan programs, or state revolving funds (CWSRFs). While states and cities supported this change due to its more sustainable, long-term nature, it also meant that states and localities were now responsible for covering 100% of project costs, rather than 45% as they were doing under the traditional federal grant program. As a 2012 report to Congress states, "the greater financial burden of the act's loan program on some cities has caused some to seek continued grant funding" (Copeland 2012, Pg. 2)

While the Water Quality Act of 1987 addressed needs for treating wastewater, Congress also took steps to address growing concerns about drinking water systems by enacting the 1996 Safe Drinking Water Act amendments. Similar to the SRFs for clean water projects, this amendment established Drinking Water State Revolving Funds (DWSRFs) (Copeland 2012).

Although federal funding for clean water SRFs was supposed to end by 1994, there have been calls to extend federal grants as funding needs remained high. The 2012 report cited an estimate of $298 billion needed for clean water infrastructure projects, and $335 billion for drinking water projects across the nation. Both SRF programs authorize EPA to make grants to states to capitalize funds, which states then use to provide loans to public water systems (Copeland 2012).

In Maryland, the Department of the Environment administers the CWSRF and DWSRF loan programs which are called: The Water Quality Revolving Loan Program (WQRLF) and the Drinking Water Revolving Loan Program (DWRLF). These programs provide low interest

low-interest loans to local government to finance wastewater and water supply improvements and upgrade. The state also administers a grant program known as the Water Supply Assistance Grant Program (MDE n.d.).

The Maryland Board of Public Works approves funding for water programs, and is made up of the Governor, the State Treasurer, and the Comptroller of Maryland ("Maryland Board of Public Works" n.d.). In 2018, the board approved a loan of $155 million from the WQRLF to fund DPW's Headworks project, and a $1.5 million grant in the form of loan forgiveness to the City (McKinney 2018).

Based on a publicly available financial statements of the WQRLF from 2013, the state of Maryland committed approximately $250 million in loans to Baltimore City, at which time the outstanding debt of the city to the state was already approximately $117 million. The financial statement also shows that Baltimore City was the second largest recipient of such funds (14% out of $1.7 billion in total commitments), after the Washington Suburban Sanitary Commission, which received about 19% of total commitments (SB and Company, LLC 2013).

Earmarked Funds: State vs. Local Governments

In addition to establishing SRFs, the federal government also began to increase the number and amount of specially earmarked grants for "needy cities" and other special purpose projects, beginning in 1989 (Copeland 2012).

Projects receiving earmarked funds have a more favorable cost-sharing breakdown than SRF loans. A city receiving earmarked funds is eligible for up to 55% in federal grants, whereas a city has to cover 100% of an SRF loan. While cities might favor this practice, it has received some criticism from state water quality program managers who question the fairness of what they see as political decisions when cities bypass the state, and appeal directly to federal officials for these funds. State officials prefer that they retain responsibility to set spending priorities and that all federal funds should be directed to capitalize state SRFs so they can quickly become self-sufficient (Copeland 2012).

Baltimore was among cities such as New York, Los Angeles, San Diego, Seattle, and Boston, that received these special funds since they were established. The CRS report indicates that Baltimore received construction grants for work on its Back River Wastewater Treatment Plant in 1992 and 1993. (Shared total of $340 million with cities listed above). It is unclear if the city has received any earmarked funds since then (Copeland 2012).

Water Infrastructure Finance and Innovation Act (WIFIA)

The most recent boost to federal funding for water projects came for the Water Infrastructure Finance and Innovation Act (WIFIA), passed in 2014. WIFIA works separately from, but in conjunction to state revolving fund programs. In essence, it operates like a national revolving fund that provides capitalization money to state SRFs or loans to particular kinds of projects. Loan repayments flow back to WIFIA, and then to the Federal Treasury, so proponents argue that WIFIA has no net long-term effect on the federal budget (WWi 2013).

In 2017, Baltimore City was one of 12 selected by the EPA to apply for WIFIA funds, out of 39 initial applicants (US EPA n.d.). The city was accepted to apply for a WIFIA loan of $200 million, out of WIFIA's total commitment of $2.3 billion (see Appendix D for a quick fact sheet of the application).

Revenue Bonds

Although State Revolving loan funds are more preferable due to lower administrative costs and interest rates, they are highly competitive and heavily accompanied by regulatory oversight. Therefore, water utilities, including DPW, often rely on revenue bonds to cover remaining capital needs (Grove 2018). Within the world of municipal finance, revenue bonds are designed for projects that are secured, and repaid by, a steady stream of charges like tolls or fees. Water and wastewater utilities in the U.S. make up a large share of revenue bond issuances since they have consistent customer bases, captured markets, and the ability to adjust rates to repay the loans (NACWA and AMWA 2013; MSRB 2017).

In Baltimore, Ordinance 02-331 authorizes City Council to issue revenue bonds to finance water and wastewater projects. A second ordinance, meant to enforce a fiscally healthy rate of borrowing for the City, places a cap on the maximum amount that can be borrowed. Under this ordinance, both water projects and wastewater projects are subject to a "maximum aggregate principle amount," beyond which the City cannot issue any more revenue bonds. However, the limit can be increased by the passing of new ordinance from City Council and the Mayor.

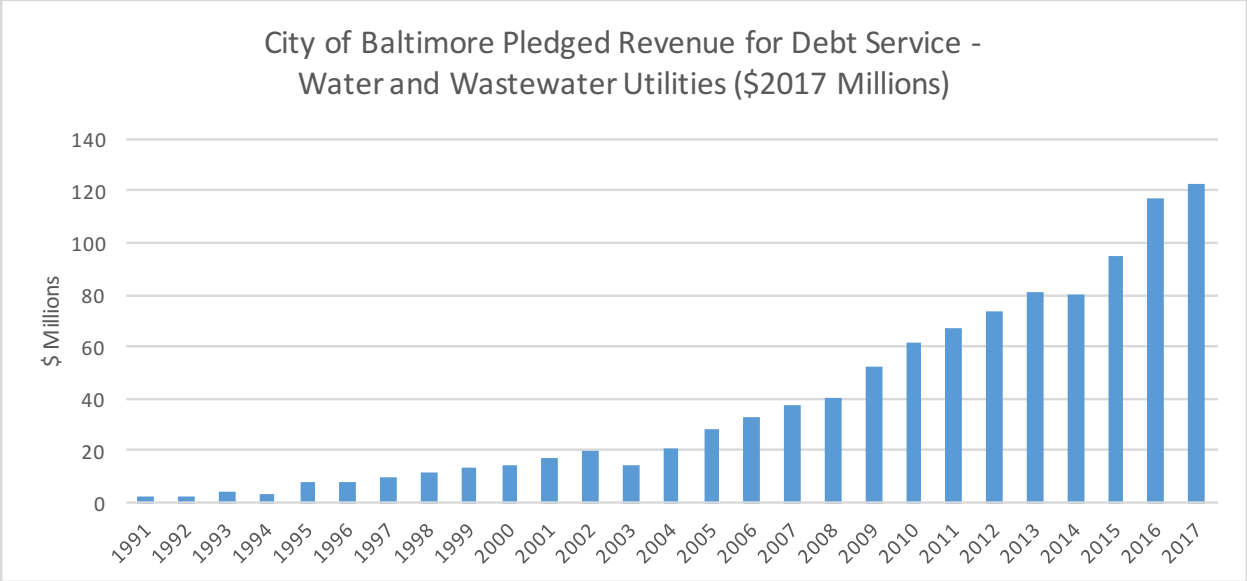
Since 1990, when the City issued its first water and wastewater revenue bond, the maximum borrowing amount has been increased six times. The latest increase in 2014 doubled the limit from $2.1 billion to $4.5 billion. Documents accompanying the approval of this latest ordinance included letters of support from different city departments including Law, Finance, and Planning (Young 2014).

In a 2014 letter to City Council regarding the increase in borrowing capacity for revenue bonds, the Law Department stated that "the maximum amount has increased several times in the past. The Law Department understands that the increase reflected in this bill is required to fund federally mandated work" (Young 2014).

Analysis in the Planning Department's letter of support noted that "without an increase, the wastewater system will run out of authorization this year, and the water system next year. When this occurs, there will be no means to raise the required funding to construct the projects identified in the capital budget" (Young 2014)

A look at yearly pledged revenue in the graph below, summarizes DPW's increasing reliance on revenue bonds over the last two decades as the primary source of finance to complete projects under pressure from regulatory and technical demands.

Figure 8: City of Baltimore Pledged Revenue for Debt Service – Water and Wastewater Utilities ("CAFR" 2000; "CAFR" 2007; "CAFR" 2017)



The accumulation of this pledged revenue is measured as outstanding revenue bond amounts in the table below. This amount has generally been increasing, which means that the department is taking out more loans than they are paying off. Increase in outstanding bonds implies a higher likelihood of continued rate increases in the future to pay off legacy costs.

Table 4:Outstanding Revenue Bonds for Bureau of Water and Wastewater Funds, FY2015-2017 ("CAFR" 2015-2017)

Outstanding Revenue Bonds (Millions)				
	Water Utility Fund	**Wastewater Utility Fund**	**Stormwater Utility Fund**	**Total (by Year)**
2015	$1,237	$1,587	$7	$2,831
2016	$1,192	$1,540	$37	$2,769
2017	$1,537	$1,652	$34	$3,224

Despite the challenge that revenue bonds pose on future costs, planning for future projects is still done on the basis of revenue bonds, because federal and state funds are competitive and not guaranteed. The graph below summarizes how DPW plans to finance its capital projects over the next six years, with the majority of financing coming from revenue loans, and the remaining being covered by County Grants and existing Utility Funds. While the capital plan does not provide further detail on what "county grants" are, it is possible that these are payments made by the county to share in the capital cost of the system from which they are served as well.

Figure 9: Baltimore Six Year CIP 2018-2023: Water, Wastewater, and Stormwater Projects (Department of Planning 2017)

Based on the timeline of the modified consent decree, Phase 1 projects are to be completed by 2021. These include the Back River Wastewater Treatment Plant Headworks project

and other “structural corrective actions” which will reduce sanity sewer overflows by 83%. Between 2021 and 2023, the utility will be undertaking post construction flow monitoring, which perhaps explains the spike in 2022. Phase 2 projects are scheduled for 2023-2030 and these will mostly upsize the sewer collection system (DPW 2017b). In addition to sewer consent decree projects, the utility will also be undergoing capital projects for the water system. This includes water main replacement, covering open water reservoirs and repairing water pumping stations (BOE 2010).

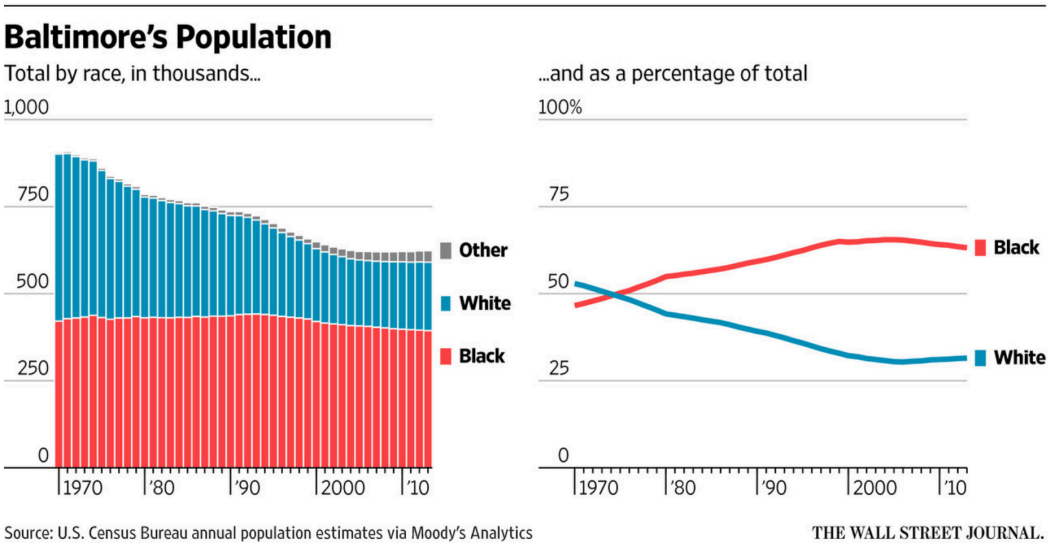
Compounding Pressures: Baltimore Demographics

As the previous sections of this chapter illustrate, Baltimore’s DPW is highly dependent on user fees to fund mandatory capital programs, and this financial structure is likely to continue over the next decade. By increasing its reliance on customer revenue, DPW exposes itself to the risk of challenging demographic trends, which either directly reduce revenue for the utility, or increase financial pressures on customers such that their ability to pay is significantly reduced.

One challenging demographic trend is population decline, from which Baltimore City has suffered for multiple decades. The Baltimore Planning Department’s website uses Census data to provide an overview of population decline in the city since the forties. Baltimore was among many cities in the U.S. that suffered from white flight as the construction of highways allowed for mostly white populations to move out from the city to the suburbs, in an effort to avoid racial integration (see

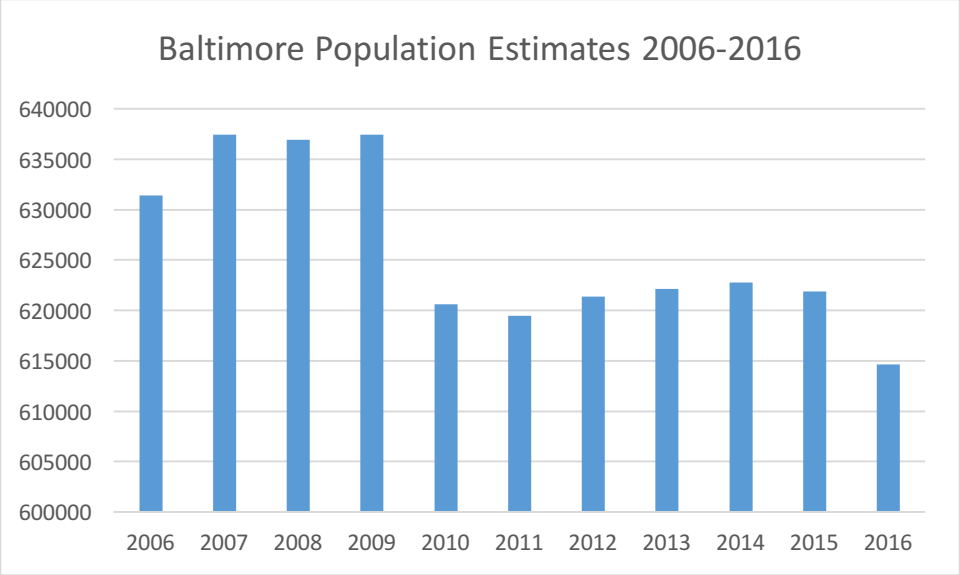
Figure 10). The city lost one-third of its residents between 1950 and 2000 as the population dropped from around 950,000 to approximately 650,000 ("Data & Demographics" 2016).

Figure 10: Baltimore's Population by Race, 1970-2014 (Yeip 2015)



The most recent yearly population estimates since 2010, seen in Figure 11 demonstrate some positive shifts and population increases in 2012 and 2013, but the subsequent decreases indicate that the population has yet to level off, or show a strong trend in a positive or negative direction.

Figure 11: Baltimore Population estimates 2006-2016 (ACS 1-year Estimates)



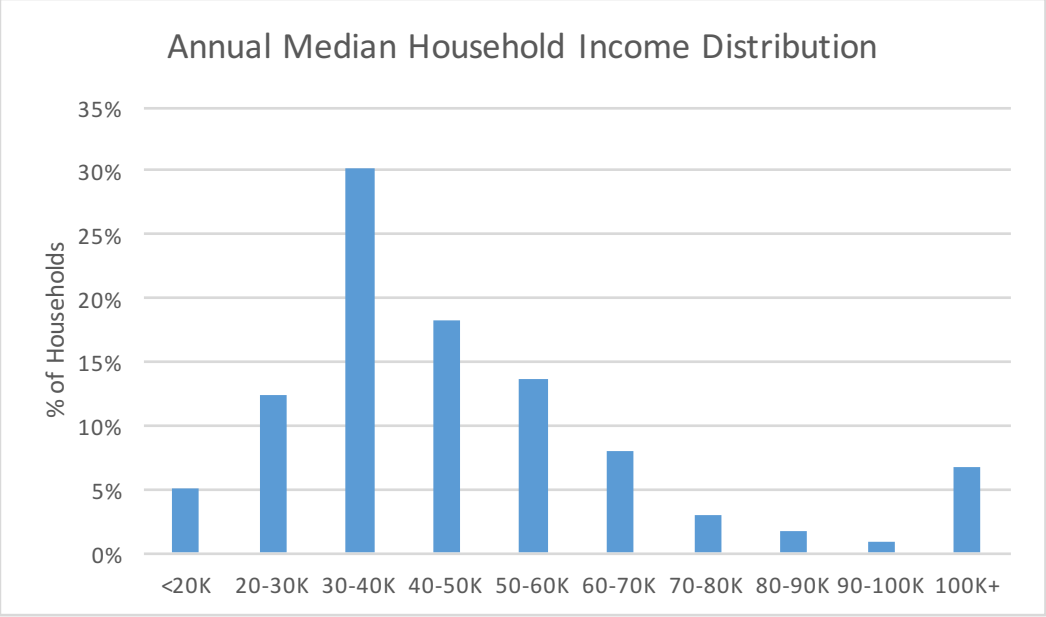
Population decreases might signal direct revenue losses for the utility as that translates to a decrease in their customer base. Since DPW measures its customers by number of account holders, population figures might not be the most accurate indicators of a weakening customer base. However, because DPW was unable to provide number of accounts before 2015, population estimates serve as a proxy for understanding the utility's struggles with revenue over the last ten years. Vacant properties, connected to population decline, also present administrative and financial challenges as the utility loses revenue to unpaid bills at vacant properties.

A decline in population can also increase financial burden on remaining residents through an increase in taxes, which reduces their ability to cover costs like water bills. As an article from the Maryland Reporter suggests, the rise of property taxes in Baltimore is linked to the first waves of population decline in the 60s, as city leaders attempted to maintain public services with a smaller tax base (Lazarick 2015). Although the City's tax rate has

decreased since the 70s, Baltimore's current tax burden is still more than twice the average rate of surrounding counties, and seen as a significant challenge to the City's growth ("Cutting the Tax Rate" 2016)s.

In addition to population shifts, the distribution of income also provides an idea of the financial burden that DPW's residents are facing. In Baltimore, almost one-fourth of the city lives below the poverty level, which is starkly higher than the national average of 15% or even the state average of 10% (Yeip 2015). Median household income is approximately $44,262 for the City as a whole (ACS 2016 5-year estimates), but highly skewed by geography, creating distinct pockets of poverty within the City.

Figure 12: Annual Median Household Income Distribution (ACS 2016, 5 year estimates)



Even if there were no capital projects for DPW to consider, the fact remains that the operational costs of this large system has to be covered by a shrinking population, which inevitably increases rates for the remaining residents. Therefore, the agency's need to undertake "the biggest environmental improvements in Baltimore in the last century," becomes a questionable burden in the eyes of customers who are either unsatisfied by the utility's performance, or are unable to pay, unable to leave, and unwilling victims of generational disinvestment.

The following chapter takes a closer look at the processes through which DPW has attempted to increase its revenues, and the quality of deliberation that takes place with the customers at each step.

Chapter IV: DPW Responds to Growing Needs

Faced with compounding pressures including decreasing volumes of financial assistance, increasing volumes of work, and a financially burdened customer base, Baltimore's Department of Public Works is struggling to keep up.

DPW's immediate response of increasing the volume and rate of technical work has produced positive results in terms of utility performance, including a 40% reduction in water main breaks within a span of two years (DPW 2017a). However, this has led to large upfront costs with a hefty long-term price tag in the form of debt repayments. Recognizing this trade-off, the Department has followed a two-pronged strategy in order to finance costs. The first strategy is to try and control costs, largely by focusing on how capital projects are planned. The second strategy is to raise more revenue by lobbying for more federal assistance, increasing rates charged to customers, and using strict collection methods. The following sections will dive into these strategies and their collateral consequences.

Controlling Costs with Integrated Planning and Outsourcing

Even though events like road collapses, drinking water losses, and sewer overflows build urgency to complete capital projects as quickly as possible, the utility is tasked with balancing technical problems that need to be addressed with the capital resources available to address them. So far DPW has tried to lower long-term financing costs by paying back loans over longer periods. For instance, the 2016 Annual report stated that while most

capital projects are paid back over 30 years, the office of fiscal management had entered into a 40-year pay-off for some projects to reduce yearly interest expenses even further (DPW 2017a). Another approach has been to push out projects to later years in an effort to reduce upfront principle costs. Both of these approaches raise the question of how such decisions are made and which projects get financed first. In Baltimore's case, their widely-publicized strategy of integrated planning begins to answer some of those questions.

Integrative Planning Framework

In 2012, the EPA issued guidance on an "Integrated Municipal Stormwater and Wastewater Planning Approach Framework" to encourage EPA regions to work with states, and allow local communities flexibility to meet Clean Water Act obligations. Prior to this, the EPA had generally been unwilling to accept affordability arguments as part of consent decree negotiations. This move presented a major shift in EPA's position, allowing municipalities to choose to pursue an Integrated Planning Framework (IPF) approach to develop requirements and schedules in enforceable documents. Baltimore was one of the first utilities to develop an IPF under this guidance and by August 2013, Rudy Chow (then Bureau Head of Water and Wastewater at DPW), was presenting a case study of Baltimore's new IPF at the International Public Works Congress and Exposition (Chow et al. 2013).

According to the case study, Baltimore's IPF uses "a triple bottom line approach that evaluates and prioritizes the City's wide ranging financial obligations for drinking water, wastewater and stormwater infrastructure." The City goes beyond EPA's guidance by including drinking water obligations in addition to clean water obligations. Baltimore's IPF

also adds a "project delivery" category to the traditional triple bottom line categories which include economic, environmental, and social criteria (Chow et al. 2013).

Baltimore's IPF model was developed as a joint effort between "top level managers" at the Bureau of Water and Wastewater and the City's Program Management Team, co-led by MWH and LBWS.

As described in the case study, the procedure for using Baltimore's IPF begins with compiling a list of Capital Improvement Plan projects for water, wastewater, and stormwater. These projects are then evaluated across the four "bottom-line" categories, which list a total of 21 benefits (see Figure 13 below). Presumably, financial benefits for the utility are counted under "alternative funding," "annual O&M costs," and "capital costs." There is no explicit mention of affordability in the listed benefits, but there is a category labeled "benefits lower income or blight areas." This is especially interesting, given that the issue of affordability is extensively discussed as a motivation for constructing and utilizing this framework (Chow et al. 2013).

Figure 13: Baltimore IPF Benefit Categories (Chow et al. 2013)

Environmental	Social	Economic	Project Delivery
Pollutant Loading to Receiving Waters – Pathogens	Health and Safety	Alternative Funding	Service Life/Condition
Pollutant Loading to Receiving Waters – Phosphorus	Recreational Access	Annual O&M Costs	Project Delay
Pollutant Loading to Receiving Waters – Nitrogen	Urban Tree Canopy	Job Stimulus	Collaboration
Pollutant Loading to Receiving Waters – Sediment	Customer Satisfaction	Capital Costs	
Pollutant Loading to Receiving Waters – Trash	Drinking Water Quality		
Regulatory	Benefits Lower Income or Blight Areas		
Habitat Preservation & Restoration			
Drinking Water Conservation & Control			

While the case study does not explain how the benefits were determined, it admits that comparing the relative values of each benefit is a challenge since there is no standard accounting mechanism across all four categories. Furthermore, DPW claims that monetized accounting or ecosystem valuations tend to be "contentious and not easily explained to community stakeholders." To minimize complexity while meeting the city's needs, DPW uses a score-based qualification system to count benefits from projects across the four categories (Chow et al. 2013).

Parallel to calculating a raw project score, the City develops weights which compare the relative importance of the 21 benefits using a software which conducts "pair-wise comparisons" until all criteria can be presented on the same scale. After conducting a team consensus across the water, wastewater and stormwater divisions, the finalized weights are multiplied by the raw project scores to develop the final project prioritization list.

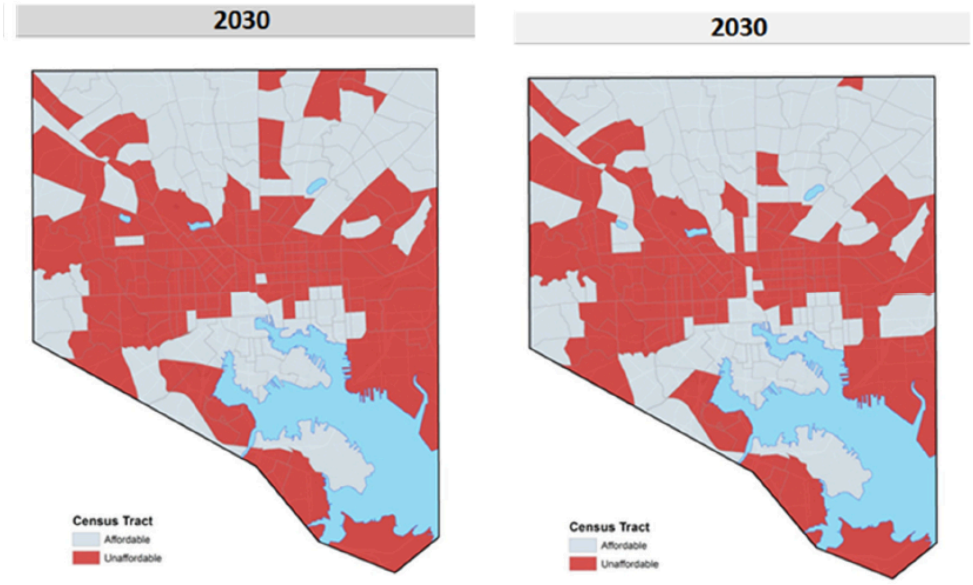
Multiple lists are developed to represent three different weighting scenarios, where scenario 1 and 2 follow EPA's IPF guidance, and scenario 3 is driven purely by regulatory requirements. In Scenario 1 and 2, "health and safety" benefits rank 2nd, and "customer satisfaction" ranks 13th out of 21. In scenario 3, both of these rank 14th and 18th respectively (Chow et al. 2013).

A financial analysis of each scenario is also conducted, with the desired goal that funding needs should be met by a mixture of long term debt and revenue funded capital, and that affordability should be maximized. The department uses a $30,000 yearly income as the tipping point for determining affordability for residents, even though this is lower than the city-wide Median Household Income (MHI) which EPA guidelines suggest is an appropriate measure of community affordability. The city justifies this decision in the case study by asserting that EPA's guidance for using city-wide MHI to determine affordability of utility services is limited, and does not give full consideration to a diverse income distribution (Chow et al. 2013). Since the case study does not provide any further explanation about the methodology with which they calculate affordability, it is assumed that the Department is following EPA guidelines which suggest 2% of MHI (or in this case, $30,000) as a minimum threshold for affordability (Ramseur 2017).

While this is a progressive step on Baltimore's part, the results of the financial analysis presented in the case study illustrates the challenge of actually addressing issues of affordability through the IPF process. The two images in Figure 14 below present results from the affordability analysis of two scenarios. In Scenario 3, the Department would

follow a purely regulatory schedule, and costs would have to increase by 146% between 2013 and 2030. In Scenario 1B, the Department would place a cap on annual spending, which would lower the rate increase compared to the earlier scenario. Still, affordability analysis under both scenarios demonstrates that a large fraction of the population would find water and wastewater services unaffordable by 2030 (Chow et al. 2013).

Figure 14: Affordability Analysis of City Census Tracts at consumption of 21 ccf/quarter by 2030, under rate increases from Scenario 3 (left) and Scenario 1B (right) (Chow et al. 2013)



The case study does not explain how the department plans to deal with communities who find services unaffordable regardless of different capital planning scenarios. It is likely that the department plans on dealing with affordability challenges for residents primarily through their customer assistance programs which are targeted towards low-income seniors and customers with delinquent notices who wish to enter into payment plans (City Council 2016; Chow 2015) A detailed list of these plans is provided in Appendix E. It should

be noted that since the publication of this list, DPW increased the eligibility threshold for senior citizens from an annual income of $25,000 to $30,000 (City Council 2016).

The robustness of DPW's customer enrollment programs has come into question due to historically low enrollment rates. As the table below demonstrates, enrollment in the senior citizens and low income resident's programs tends to be in the range of two thousand customers, while the number of households that make less than $30,000 a year is over 100,000 (ACS 2016 5-year estimates). Since water bill amounts are based on water consumption, it is possible that not every household that makes less than the $30,000 will require assistance. However, studies that have analyzed DPW's assistance programs point to poor outreach and advertisement as causes of low enrollment (Jacobson 2016; Colton 2017). These studies also question the robustness of assistance programs, highlighting that there is need for "crisis intervention" policies to address the challenges of lower income households living on unstable incomes who often face unexpected expenses or loss of income, which subsequently sets them behind on bills. Although the low-income water assistance program allows customers to enter into payment plans, there is no discussion of debt-forgiveness for households who have unaffordable debt in arrears (Colton 2017).

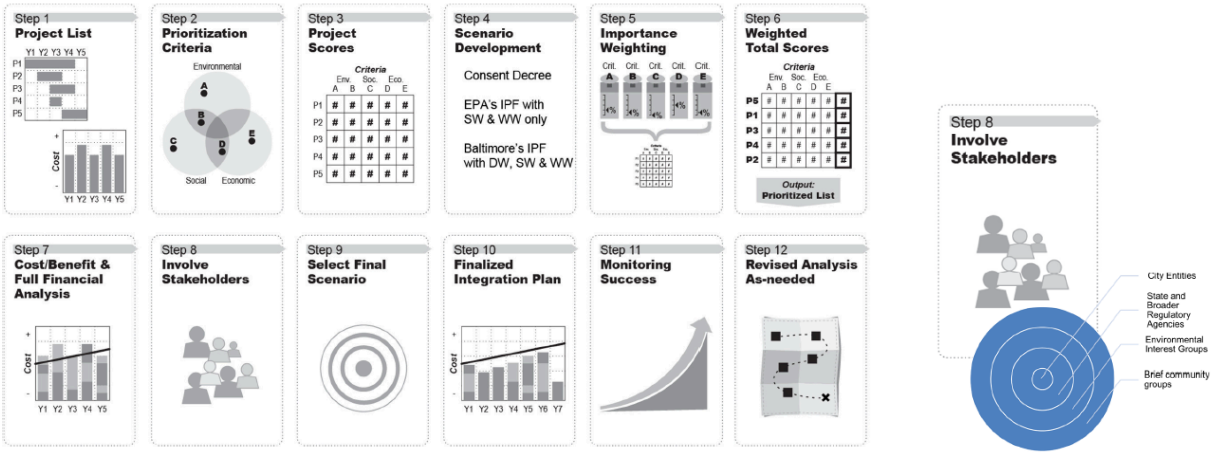
Table 5: Number of Participants in DPW Customer Assistance Programs, 2010-2016 (City Council 2016)

Fiscal Year	Senior Citizen Water Discount Participants	Low-income Water Assistance Participants
2010	2601	1836
2011	2273	1998
2012	2149	1293
2013	2121	1461
2014	2374	1973
2015	2645	2433
2016	2777	1992

Stakeholders in the Planning Process

At the time that the case study was presented in 2013, the City had only completed part of the Integrated Planning Framework process, and had yet to incorporate stakeholder feedback. According to the complete IPF process seen in the image below, stakeholder involvement is step 8 of the 12-step process.

Figure 15: DPW's Integrated Planning Framework Process (Chow et al. 2013)



The case study elaborates on DPW's stakeholder engagement strategy by saying that the process requires that "the right IPF information be targeted to the right groups," where the identified "right" groups include city entities, state and other regulatory agencies, environmental interest groups, and brief community groups. For community groups, proposed key messages include neighborhood impacts and benefit criteria/weighting. The case study ends with the teams hopes that IPF will lead to meaningful public input provided on at least an annual basis.

While the desire to include stakeholders is a promising sign of including deliberation and allowing customers to have a say in the capital planning process, the placement of stakeholder involvement in the overall process is concerning. The utility wishes to involve select community members after the scoring, scenario development, and financial analysis has already been done, which raises the question of how community feedback will be incorporated, if at all. The process risks falling into a category of public participation where residents are asked to advise and consult, without their inputs having any "binding" power, as desired by the democratic deliberative ideal (Mansbridge et al. 2010). Given that there is little information regarding the impact of stakeholders in the capital project planning process, and there is no involvement of customers in the planning of customer assistance programs, it is unclear where customers can actually exert authority in the planning and payment processes.

The case of DC Water in chapter five provides some insight into what a deliberative planning process could look like, and the subsequent recommendations highlight

opportunities to bring DPW's planning and payments processes closer to the deliberative ideal.

Outsourcing Implementation

In addition to optimizing utility expenditures through new planning frameworks, non-financial indicators suggest that the department is also trying to cut costs by reducing its workforce and outsourcing work. The city's comprehensive annual financial reports account for city employees by department, and according to these reports, DPW's full-time employees have dropped by 32% between 2000-2017 ("CAFR" 2007; "CAFR" 2017). It is unlikely that this reduction was due to a decrease in the utility's workforce needs, since this was also the period during which the Consent Decree began, and the utility ramped up its efforts to replace its water and wastewater distribution networks.

During this period, DPW also increased the number and volume of consultant contracts, indicating that the utility was actively outsourcing much of the new work that it was undertaking. An article from 2013 reveals that the Board of Estimates approved $27 million in sewer consultant contracts, to the opposition of the City Council President and City Comptroller who were concerned that the consultants would be charging more than it would take to complete the work in-house (Reutter 2013). This also came after a 2012 audit from the Inspector General who discovered that DPW had been overbilled by over $26,000 from one particular contractor (McClintock 2012). While the overbilled amount represents a small fraction of the total contract value, it brings to light the need for significant oversight of all contracts.

Risk of fraudulent billing, or costs associated with oversight are not enough of an argument to challenge outsourcing, given that that the benefits of outsourcing work are still significant when it requires specialized skills that would cost more, or take a longer time, to develop in-house. Yet, the reduction of staff coupled with rise in contractor work is a worrying trend in the long-run, given the past experience of Baltimore's neighboring utility, WSSC.

Conversations with WSSC staff in 2015[5] revealed that many of the utility's challenges resulted from actions that had taken place over a decade earlier. Specifically, several programs had been cut or scaled back during a drive to reduce costs. In what one employee described as the "2000 purge," not only had the workforce been reduced by a third (from 2200 to 1500), but programs and departments like the right-of-way maintenance program and the engineering records department were deemed 'redundant' and dissolved. This resulted in unintended consequences that were clearly visible in the present day. For instance, the right of way program had been responsible for preventative maintenance such as trimming vegetation to ensure that all assets remained accessible at all times. After this program dissolved, the utility service department complained that finding assets in the field was a huge obstacle since most of their assets had been encroached by trees or other overgrown vegetation. Not only was it a hassle to figure out where assets were located, but once located, they had to pay a premium to cut down these encroachments that would have

[5] I conducted these interviews while I was employed by Louis Berger (LB), for a project where LB was hired to consult on the design of an innovation program for WSSC.

otherwise been trimmed regularly. Similarly, the dissolution of the records department resulted in unforeseen consequences as present day engineers found themselves at a loss for over a decade's worth of engineering records. For utilities, maintaining records allows employees to understand the nature of assets in the field, and to predict their performance and plan for future maintenance, repairs, and replacements.

WSSC's experience highlights the long-term costs associated with loss of institutional knowledge due to workforce reduction, and explains why this approach might be a less than effective cost-controlling measure for DPW in the long run. Re-evaluating the reliance on contractors could produce both efficiency gains for DPW, and equity gains for customers, who are ultimately responsible for funding all DPW contracts. However, the existing process for determining consultant contracts is limited to requests from DPW to the Board of Estimates, which votes on approval. The strength of voting as a deliberation mechanism is discussed further in detail later in this chapter.

Raising more revenue

While capital costs can be reduced with financial and technical planning mechanisms, they cannot be erased. Once projects have been decided upon, DPW has to find the money to pay for them.

As illustrated in the previous chapter, DPW's main source of revenue comes from its customers. Even though the utility relies heavily on debt to pay for upfront capital costs, these loans are secured and paid back through revenue from customers, with guarantees to

the investors that rates will be increased when necessary. In addition to this guarantee to investors, the utility also guarantees the city that it will remain a "self-sustaining" entity, and will not rely or borrow from the City's General Funds ("Rates & Fees Overview" 2015).

Although the utility has turned to the federal government to request and lobby for more assistance, the following subsections will illustrate how inaction at the federal level has resulted in the utility passing on much of its financial pressure onto its customers by raising rates, and increasing collection of bills.

Lobbying the Federal Government

On April 7th, 2016, Rudy Chow testified in front of the Senate Committee on Environment and Public Works on behalf of the City of Baltimore, the Water Environment Federation, and the WateReuse Association. The topic of the Senate Hearing was on the federal role in keeping water and wastewater infrastructure affordable. Chow was joined by other representatives including the chairman of the American Water Works Association, a representative of the National Rural Water Association, the National Association of Water Companies, and the Natural Resources Defense Council (Inhofe 2016).

Citing affordability issues and the economic benefits from federal funding, Chow used his platform to request more funding for both state revolving funds and WIFIA. For the Clean Water SRF, Chow requested an increase from $1.39 billion to $2 billion, and for WIFIA, he requested funding at the level of $35 million. Chow also argued against any efforts to

change tax deductibility levels on tax-exempt municipal bonds, warning about harmful consequences on the appeal of these bonds to investors (Inhofe 2016).

Chow's requests were echoed by other witnesses at the hearing. Arnel Arndt, the chair of the Water Utility Council at the American Water Works Association, provided context for the $35 million request for WIFIA by explaining that small appropriations to WIFIA had resulted in EPA being unable to provide any loans in the first two years of the program. Arndt also supported increased SRF funding, but went further by requesting $1.3 billion for the drinking water SRF in addition to money appropriated to the clean water SRF, stating that the needs of drinking water and wastewater are roughly equal and that investments should reflect that (Inhofe 2016).

Financial documents from FY 2017 reveal that Chow and Arndt's requests were not fully met. CWSRF funding did not increase from the prior year, remaining at $1.39 billion, DWSRF funding increased slightly to $900 million, but remained below the desired $1.3 billion. WIFIA funding was slightly more successful, receiving $10 million, a significant boost from the $2.2 million it had received for two years prior (Holmes 2017).

Still, water utilities like DPW continue lobbying the federal government for increased funding every year. In March 2017, almost a year after the hearing, Chow was leading the charge yet again by helping to advertise and facilitate a "Water Policy Fly-In" in DC along with nine other national water associations (Chow 2017). In a statement on the Water Environment Federation's Blog, Chow wrote:

"As a sector, it is our responsibility to advocate for sound policies and increased financial support for the infrastructure investments we must make to protect public health, the environment, and economic growth."

Chow's involvement with national associations to help spur federal funding for infrastructure investments, makes it clear that he believes federal funding should increase. But his agency's capital plans continue to omit federal funds as a resource when planning projects, recognizing that federal spending is contingent on political will that is beyond the control of a single city agency or even several national associations. While the political will of federal officials is dependent on public constituents who are, theoretically, able to vote officials out of office, it is unclear whether citizens are even aware of the political negotiations of lobbying efforts between utilities and federal representative. Lack of information regarding negotiations between DPW and federal officials serves to further remove customers from the decision-making processes which impact their water rates. It also spurs anger amongst customers who, unaware of federal and state level negotiations, think that the utility could be doing more to increase funding from sources beyond ratepayers. Evidence of these sentiments will be provided in further detail in the next chapter.

Increasing Water and Wastewater Rates

While federal assistance continues to flounder due to political gridlock, water and wastewater rates offer a tool within the utility's control, and therefore the easiest solution for the utility's financial hardship. Since the 2002 consent decree, water and sewer rates in

Baltimore have more than tripled. As seen in the table below, this increase has taken place at an average rate of about 9% annually.

Table 6: DPW Rate Increases and Average Household Bills, 2002-2018 (DPW 2018b)

Year	Water Rate Increase	Wastewater Rate Increase	Average DPW bill for residential accounts by meter size		
			Quarterly Charges for 5/8"	Quarterly Charges for 3/4"	Quarterly Charges for 1"
2002	10%	10%	$28	$50	$112
2003	9%	9%	$31	$56	$124
2004	9%	9%	$34	$61	$136
2005	9%	9%	$37	$67	$150
2006	9%	9%	$41	$74	$165
2007	9%	9%	$45	$81	$181
2008	4%	4%	$50	$90	$199
2009	9%	9%	$52	$93	$207
2010	9%	9%	$57	$103	$228
2011	9%	9%	$63	$113	$250
2012	9%	9%	$69	$124	$275
2013	15%	15%	$75	$135	$300
2014	11%	11%	$86	$155	$345
2015	11%	11%	$96	$172	$383
2016	9.9%	9%	$106	$191	$425
2017	9.9%	9%	$181	$245	$371
2018	9.9%	9%	$198	$267	$405

Note: Charges in bold indicate data received directly from DPW through a public information request in spring 2018. All other charges have been estimated using the water and wastewater rate increases. Water and wastewater rate increases were gathered from Board of Estimates Meeting Minutes from 06/09/2010, 07/03/2013, and 08/31/2016. Rate increases prior to 2010 have been taken from a publicly available DPW presentation

on the updated consent decree from 06/07/2016. Charges are shown as quarterly totals rather than monthly or yearly totals because until October 2016, the department billed customers every quarter.

Because most utilities follow a similar financial structure, this story is similar for all utilities across the board. According to the American Water Works Association (AWWA), between 2004 and 2014, water and wastewater rates increased at an annualized rate of 5.5% and 6.1% respectively across the country (AWWA and Raftelis 2017). The fact that DPW's increases have been even higher than that of the national average, could be due to historically low rates, but the information to confirm this is unavailable.

Due to compounding financial pressures in Baltimore, requests for rate increases have been accompanied by pushback from city officials and residents. As described in the previous chapter, water and wastewater rates are set by the Board of Estimates, which is made up of five voting members ("Board of Estimates" 2015). In order to pass rate increases, DPW is required to submit a request to the Board with analysis on what the changes are, why they are necessary, and how they will impact the customers. The Board reviews DPW's report in addition to a second report provided by the Department of Audits, which either supports DPW's requests as 'reasonable,' or provides alternative recommendations. Once both reports have been reviewed, a public hearing is set to hear arguments for or against the request, and to allow DPW to respond to any clarifying questions. At the end of this hearing, members of the Board vote on the motion. For the last 8 years at least, every motion to increase the rates has passed (BOE 2010, 2013, 2016).

Online archives available on the Board of Estimates website provide a history of DPW's rate increase requests dating back to 2009. According to these documents, DPW has requested rate increases three times, in three-year increments. First in June 2010, then July 2013, and most recently, in August 2016. Each request has been supported by explanations of rising utility costs, and the argument that even with the rate increases, the absolute cost of bills was still low relative to other expenditures or relative to equivalent services in other cities (BOE 2010, 2013, 2016).

Consistent with the finding that DPW began to see a need for investments in the early 2000s, documentation since 2010 proves that DPW has constantly argued for higher rates to support growing portfolios of capital plans. As Kiesha Powell, DPW Bureau Head for Water and Wastewater, stated at the 2010 Board of Estimates Public Hearing: "We not only have to choose how to spend our money, we have to choose to spend money" (BOE 2010). The urgency of this need continued to build over the years, with major system failures providing the evidence necessary to support this argument. Concurrently, the lack of availability of other funds has also been a major theme at the public hearings. Ms. Powell cited EPA's $534 billion funding gap to argue that greater reliance on customers was inevitable, given the utility's financing structure and the federal government's financial position:

"I don't think that we can expect that we'll get a significant amount of funding to deal with this issue. We have to take the bull by the horns and deal with it ourselves. Unfortunately, that's the way all utilities are established" (BOE 2010).

The imagery of a bull fight perfectly encapsulates the problem as DPW sees it. The lone fighter in this case is the utility, abandoned by any form of assistance from other players, facing the difficulty of taming a beastly problem. And the responsibility of arming this fighter, falls squarely on the shoulders of customers, spectators to the game, who are assured that they ultimately benefit from it.

However, representatives of DPW have been quick to add that despite rate increases, absolute costs are still reasonable in relative terms:

Keisha Powell: "Gas and electric, cable, cell phones, whatever you use, you're paying a fee for it. We are lower, and we are an essential service" (BOE 2010).
Rudy Chow: "We have low rates compared with cities on the East Coast and compared with other jurisdictions within the state" (BOE 2013).
Jay Price: "In an age in which people are willing to pay well over a dollar for a 20 oz. bottle of water, Baltimore City families get an entire day's supply of water – available at the tap – for around one dollar" (BOE 2016).

While few people question that customers must pay, the size of this responsibility is what ultimately comes up for debate at these public hearings. In 2013, the Department of Audits

disagreed with DPW's requested rate increases, stating that they were higher than necessary for the utility to be self-sustaining and to meet its operating reserves and debt-service requirements. Then Bureau Head, Rudy Chow, who would ascend to the Director position only a year later, responded that DPW's financial policies aimed to meet standards set by credits rating agency Fitch, which required utilities to have cash-on-hand for a minimum of 90 days. The audit department had been projecting expenses and revenues based on the legal covenants in the official statements for the federal consent decree, which only required cash on hand for 30 days. According to Rudy Chow, the audit department's recommended increase, as seen in the table below, would create "undue financial risks" for the utility and be fiscally irresponsible, because it would limit their access to debt markets (BOE 2013).

Table 7: Department of Audits Recommended increases for Water and Wastewater rates (BOE 2013)

Year of Adoption	DPW Requested Increase for Water and Wastewater Rates	Department of Audits Recommended Increase for Water Rates	Department of Audits Recommended Increase for Wastewater Rates
2014	15%	13%	12%
2015	11%	11%	9%
2016	11%	11%	10%

Setting aside the question of how "fiscal responsibility," should or should not be defined for a utility, it is unclear why, in 2013, the Department of Audits was unaware of DPW's financial policies and standards, which had been set back in 2002. The exchange begins to demonstrate a lack of communication between the Department of Audits and the Department of Public Works. The Comptroller, Joan Pratt, highlighted this fracture when,

minutes later, she accused DPW of failing to meet with the Department of Audits, and waiting till the last minute before sending over required financial information (BOE 2013).

In addition to disagreements over what percentage of rate increases are necessary, the Department of Audits also disagrees with the increments in which rate increases are approved. In both 2013 and 2016, the auditor and Comptroller recommended that rate increases should be limited to one year, and revisited for subsequent years, due to uncertainties is estimating revenue and expenses in advance. DPW responded that a three-year proposal provided the best balance between uncertainty and the need to provide a stable working environment for efficient and effective long-term capital planning (BOE 2013).

Other than the Department of Audits, concerns also originated from City Council President Jack Young, who brought up issues with contracts and customer assistance. According to Young, cost overruns on contracts provided evidence that DPW was not trying hard enough to control costs before asking for rate hikes on customers. He was also dissatisfied with reforms to the eligibility criteria for customer assistance, particularly for senior citizens. In 2016, DPW increased the threshold income level at which seniors became eligible for assistance from $25,000 to $30,000. Young held that the level should have been increased even further to $40,000 (BOE 2016).

Although one might have expected members from the public to join the chorus of concerns against rent increases at public hearings, meeting minutes indicate that no one testified at

the 2010 hearing and only one citizen testified at the 2013 hearing (BOE 2010, 2013). Meeting minutes from 2016, however, include transcripts of 26 individuals who testified against the rate increases (BOE 2016). This spike in public engagement could be due to a number of reasons. The most likely cause is that the 2016 hearing followed a series of events in 2015, when DPW's practice of water shutoffs became widely publicized, and citizen coalitions were formed to address the issue (Eckell, Vaidya, and Heddon 2018). The subsequent testimonies from 2016 provide numerous stories from residents about their inability to keep up with rising water costs. While this does not mean that residents were unburdened by rate increases prior to 2016, it does indicate that the public became more vocal about their struggles after 2015.

Despite concerns voiced at all three hearings, all three requests passed by a majority vote (see table 8 below). Notably, the City Solicitor, head of Baltimore's Law Department, did not ask any questions, or voice any concerns at any of the meetings. The Mayor, Stephanie Rawlings-Blake, provided testimony in support of DPW on all three occasions. In 2016, she noted her role as President of the U.S. Conference of Mayors, to indicate her advocacy for more federal funding of infrastructure, but also stressed that as a leader of the city, she could no longer afford to "kick the can down the road" (BOE 2016).

Table 8: Record of votes for and against requested rate increases, 2010-2016 (BOE 2010, 2013, 2016)

Year of Public Hearing	Board of Estimates				
	City Council President (Jack Young)	City Comptroller (Joan Pratt)	Mayor (Stephanie Rawlings-Blake)	Director of Public Works	City Solicitor
2010	No	Unknown	Yes	Yes	Yes
2013	No	No	Yes	Yes	Yes
2016	No	No	Yes	Yes	Yes

Note: The positions of Director of Public Works and City Solicitor were held by different people at each of the three hearings. David Scott, Alfred Foxx, and Rudolph Chow held the position of Director of Public Works in 2010, 2013, and 2016 respectively.

Although the public is given a chance to present their interests before the board during the hearing, the vote is seen by the public as unjustified coercive power being exerted by the city government on the residents. Mansbridge et al. (2010) suggest that voting is justified in the deliberative democratic ideal when each vote is "equal" with no vote-buying or exchange of goods. Here, the Board of Estimates process falls short of the ideal since some argue that three of the five voting members are politically connected. The Director of Public Works and the City Solicitor are both appointed by the Mayor, and therefore their alignment with the Mayor is seen as an act of self-interest. Even more cause for concern is the fact that the Director of Public Works is the Director of the organization making the request for the increase, and therefore likely to benefit directly by voting in favor of all DPW requests. If checks and balances within Board procedures appear to be weak, citizens

are less likely to be satisfied with any outcome, regardless of the validity of the reasons behind it.

Furthermore, Baltimore resembles the contexts which Mansbridge (2010) describes as "deeply segmented," where voting is less justified because minorities on one issue are likely to be minorities on another issue, as discussed in further detail in the next chapter.

The passage of rate increases creates further dissatisfaction when citizens bear heavy consequences for not paying their bills, regardless of whether or not they are able to pay.

Increased Collection Efforts

In addition to increasing rates to generate more revenue, DPW has also actively addressed issues of unpaid bills, in order to recover, or collect, as close to 100% of expected revenue as possible. At the 2010 Board of Estimates Hearing, one of the recommendations that the Department of Audits had for DPW was to improve collection efforts, so that uncollected revenue would not drive the need for rate increases in subsequent years (BOE 2010).

The table below illustrates that the Department has been unable to collect between 10% and 17% of its total billings over the years. What the data does not distinguish, however, is how much of the debt carries over from year to year, given the efforts that DPW takes to collect debt through two primary mechanisms: Shut offs and Tax Sales.

Table 9: DPW Uncollected Debt and Delinquent Accounts (BOE 2013; DPW 2018b)

	2013	2015	2016	2017
Dollars Billed to Customers	N/A	$418,838,000	$417,972,000	$418,124,251
Uncollected Debt ($ Total)	$24,524,000	$44,863,055	$69,596,624	$43,649,963
Uncollected debt (%)	N/A	11%	17%	10%
Residential Share of Uncollected Debt	51%	89%	72%	32%
No. of Accounts with Debt ("Delinquent")	15,013	41,253	48,964	12,708
% Delinquent Accounts	N/A	10%	11%	3%
Avg. Debt for Residential Account	$853.95	$978.72	$1,043.31	$1,230.62

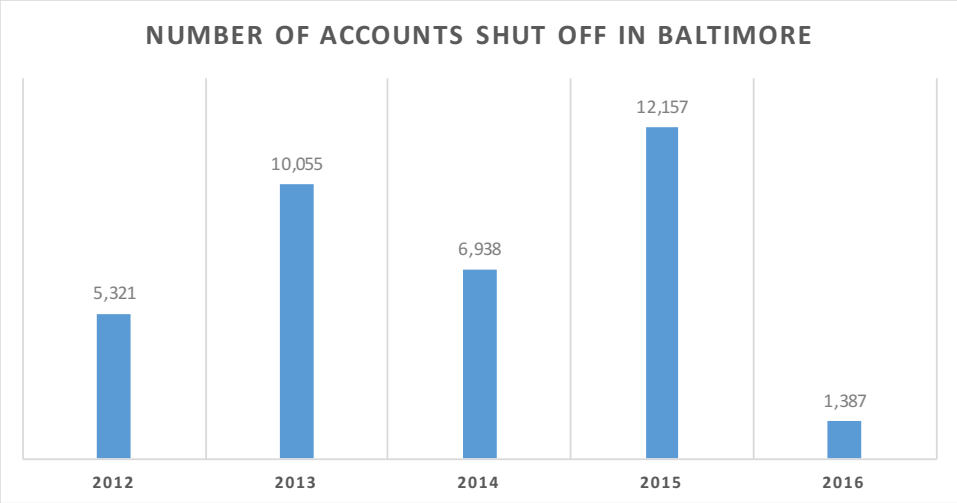
Note: DPW provided data for fiscal years 2015-2017 in response to a public information request in spring 2018. 2013 data is from a Board of Estimates meeting on 07/03/2013. Average debt for residential accounts is an estimate based on total residential debt divided by total number of delinquent residential accounts, where 'residential' is defined as any meter less than 1.5" in size.

As stated in the previous chapter, the Department's standard operating procedures dictate that a customer's water and sewer service can be terminated if a charge on the account remains unpaid for more than 30 days, and the accumulated charge is greater than $250 (DPW 2015b). Similar to other utilities like gas and electricity, a water shut off is conducted in the hopes that customers pay their bills in order to restore service. Still, shut offs serve as a measure of last resort, after customers have received notices indicating that they are delinquent, and that they will be subject to turn off between April and October, which is the

season during which DPW conducts shut offs, because heating systems require water to distribute heat to buildings during the winter (Chow 2015).

Data on shutoffs is difficult to come by, but the graph below provides information on the number of shut offs that took place between 2013 and 2017.

Figure 16: Number of Accounts Shut Off in Baltimore, 2012-2016 (DPW 2018b)



Based on this information, between 1% and 3% of all accounts are shut off yearly, or as data from 2015 shows, approximately 30% of all delinquent accounts are shut off (DPW 2018b). It is difficult to determine absolute trends from these numbers because they do not reveal how many accounts, if any, are turned back on. Anecdotal evidence presented in a report published by the Abel Foundation reveals that some customers have had their accounts shut off for years (Jacobson 2016). If that is the case, it is possible that the numbers in the graph above are a conservative estimate, given that they might only represent new shut offs, and not those accounts that have been shut off for longer than one year.

Another complication with this data is that DPW's records do not distinguish between accounts that belong to vacant versus occupied households. According to DPW's testimony from a City Council public hearing on Water Affordability in October 2016, there is no tie-in between a property's occupancy status, and that which determines whether or not it is delinquent (City Council 2016). And since DPW does not keep track of customers with accounts that are shut off, the utility does not know if houses become vacant after a shut off is initiated, potentially leading to displacement of families and exacerbating the city's vacancy problem (Jacobson 2016).

At the hearing, when Councilman Bill Henry pushed DPW by asking representatives why the utility does not work with the department of housing, such that the two organizations share a list of vacant properties to help DPW optimize their shut off strategy and keep clearer records, Maria DeChellis responded by saying that the two didn't share the same record keeping systems, which made sharing information inefficient and difficult (City Council 2016).

In addition to vacancies, it is also difficult to distinguish between accounts that serve households versus businesses or industries. DPW categorizes accounts as "residential" or "commercial" based on the size of the meter. Meter sizes of 1.5" or less are categorized as residential accounts and larger meters are designated as commercial (DPW 2018b). However, some delinquent accounts that are labeled "commercial," are actually 'multi-master metered landlord accounts,' meaning that a single account serves a large multi-unit

residential building. DeChellis indicated that these accounts tend to make up a large share of the department's uncollected debt, but it is difficult to verify that statement, since DPW does not categorize its data accordingly (City Council 2016). So one termination of a "commercial" account could potentially impact tens or hundreds of families. In that case, the recorded number of accounts that are shut off are once again a conservative estimate of the actual number of people that are impacted.

DeChellis acknowledged that these master metered accounts presented a challenge to the utility, and that the department had been working on a "different approach" to collecting debt from these accounts, in partnership with the City's legal department, in order to minimize impact on households. While it is unclear what this new approach or policy is, DeChellis offered that it is the reason behind the lower number of shutoffs in 2016 (City Council 2016).

A lower number of recent shut offs might be comforting to some, but the fact remains that people are unclear about how and why the Department makes decisions to conduct shut offs, given that only a fraction of delinquent accounts is actually terminated. This aggravates perceptions that the Department is treating particular groups of customers unfairly. In the absence of DPWs explanation for how such decisions are made, researchers have tried to collect more data on shut offs to determine any correlations or trends that would reveal the utility's strategy. For example, in order to understand if there is a correlation between the size of someone's debt and a shut off occurring, Roger Colton, an independent consultant working with Food and Water Watch, publicly requested DPW for

information on average residential debt at the time of a disconnection. The utility responded by saying that "DPW does not retain responsive data," leaving advocates and citizens unclear yet again (Colton 2017).

Vacant houses, large multi-unit buildings, and seemingly discretionary shut off practices present just a few reasons why shut off data can be so difficult to interpret. Difficulty in interpretation leads to lack of understanding and implies potentially overlooked losses for a utility that is desperate to optimize revenue. Lack of clarity also feeds the distrust of citizens who are already burdened by high rates, and suspicious of the department's dealings, as described further in the next chapter.

Lack of clarity from DPW however, has not stopped advocates and civil society organizations from highlighting the impacts of shut offs on residents, particularly starting in 2015, motivated in part by a national conversation over shut offs. Although the practice of water shut offs is not new to Baltimore, or other cities, it became part of the national conversation after Detroit came into the limelight for shutting off water to about 17,000, residents in 2014, following the City's bankruptcy (Hackman 2014). The issue even attracted the United Nations attention, which is usually reserved for condemning human rights violations in lower income countries. In a statement issued in June 2014, the UN human rights commission issued the following: "Disconnection of water services because of failure to pay due to lack of means constitutes a violation of the human right to water and other international human rights" (UN News 2014).

When DPW issued 25,000 shut off notices subsequently in 2015, advocates in Baltimore drew parallels to the situation in Detroit and organized against the practice (Dale 2015; Broadwater 2015a). Despite the concerns over potential public health outbreaks, and revelations that termination of water service could lead to additional consequences like eviction or losing one's children, shut offs have not ended. To understand why this practice continues, it needs to be analyzed in conjunction with the tax sale process.

Tax sales represent another controversial practice that DPW utilizes to recover lost revenue from unpaid bills. Since water and wastewater charges are considered a lien on the owner's property, if a delinquent DPW account accrues more than $750 in late charges, the property with which that account is associated can be sent to tax sale (Senator Eckardt and Delegate Walker 2018). DPW sends a list of accounts eligible for tax sale to the Department of Finance in December (Henn 2018) at which point in enters the city's tax sale process. Notices are sent to the property owners in February, and if the charges remain unpaid, the properties begin to get listed in the Baltimore Sun and BidBaltimore.com beginning in March. April 30 is the final deadline for homeowners to pay the outstanding amounts on the liens, before auctions begin in May ("BidBaltimore: Auction Schedule" n.d.). If a lien or certificate is bought by an investor, the city recovers all outstanding charges at once. Occasionally, the city collects more revenue than just the outstanding amounts on the liens, as investors try to outbid each other for certain properties (Henn 2018). Once the lien is bought, an investor has two years to "redeem the lien" or foreclose on the property. Homeowners who wish to take back their properties have to pay the investor the amount

of the lien, plus 18% interest, and other legal fees and court costs (Graziani and Alexander 2016).

While the tax sale system is by and large a method to enforce property tax collection, in Baltimore, many liens include water bill charges in addition to unpaid property taxes. In some cases, liens consist of only water bill charges. Table 10 below shows that in the last four years, about 14-17% of all tax sales have been due to delinquent water bills only. This is a conservative estimate of the impact of water bills given that it is possible many more accounts had water charges in addition to unpaid property taxes. However, this information is not recorded in the available datasets. In fact, the Mayor's Office of Information Technology did not even keep track of "water only" tax sales prior to 2016 (O'Leary 2018). The data on water only tax sales had to be acquired from DPW in the form of a public information request.

Table 10: Baltimore Tax Sale Data, 2012-2017 (BidBaltimore, n.d.; DPW 2018b)

	2012	**2013**	**2014**	**2015**	**2016**	**2017**
Total properties listed for tax sale	26,730	28,759	23,798	28,853	22,101	26,106
Total properties sold in tax sale	10,519	9,956	8,278	11,936	9,891	10,861
Properties listed for tax sale due to water bills only	N/A				2722	N/A
Properties sold due to water bills only	763	891	1441	1742	1341	1745
Percentage of sales from water bills only	7%	9%	17%	15%	14%	16%

Note: The total properties listed and sold have been calculated from information available on bidbaltimore.com. Data on properties sold due to water bills only is from a DPW response to a public information request. Data on properties listed for tax sale due to water bills only is from the tax sale coordinator for the city's Department of Housing who left the position after 2016.

Again, the data is limited in terms of understanding whether properties were vacant or occupied prior to the sale or after the sale, which would have significant implications in terms of understanding the impact of this practice on low-income residents.

In terms of understanding the financial effectiveness of this practice for the utility, it is unclear how much money DPW collects from tax sales in general. Margaret Henn, a project manager at the Pro Bono Resource Center in Baltimore, indicated that the Department had recouped around $30 million from tax sales in 2017, or about 70% of their total debt for that year. Even with this data point, we do not know how much of that was collected from account holders prior to the lien being sold, and how much was collected from investors who bought the remaining liens.

The distinction between who pays a bill after a shut off or tax sale notice, and who doesn't, is critical to understanding how effective the collections processes are, what their long term impact might be, and who is benefiting. At the moment, given limitations in information, one can only hypothesize what might be going on, as summarized in the scenarios below:

a) The utility is recovering all (or 'enough') revenue through customers who pay back their bills once they have been disconnected, or once they have received a notice of tax sale. This means that it is in the utility's interest to continue the practice, and the majority of customers still retain access to basic services once they pay the bills and late fees. Only a small portion of customers are negatively impacted.
b) The utility is recovering revenue through outside investors or new residents who displace low-income residents that are unable to pay their bills even after receiving notification of impending disconnections and tax sales. This might be in the utility's interest, but comes at the expense of low-income customers who are essentially forced out of their homes.
c) The utility is not recovering enough revenue through existing collection processes, but the higher rates allow for enough of a financial reserve, such that customer debt does not impact the utility's financial health significantly. This might be acceptable for the utility in the short-run, but could lead to significant financial problems as people's ability to pay their bills decreases as rates continue to rise. This also disregards the struggles of low-income customers until more people are impacted.

The scenarios listed above might provide a framework for decision makers to conduct analysis and chart a course forward that is in the interest of both the utility and the customer. However, the scenarios fail to acknowledge the part that perception might play in altering decisions and outcomes.

For instance, if the utility believes that people are not paying because they are unwilling, rather than unable, it will continue to punish people severely for not paying their bills, regardless of the effectiveness of their actions. Meanwhile, those who are truly unable to pay their water bills, would face the reality of dire, and, disproportionate consequences. Residents stand to lose a $100,000 home over a $1000 unpaid bill. Or, in the case of a shut off, they resort to living in substandard conditions, using food stamps to buy water, and gym memberships to shower, so that they can maintain a minimum level of health (City Council 2016). Alternatively, if customers feel as though they are being treated unfairly, they have more reason to resist every change the Department makes, including more rate increases.

The public narrative at the moment, highlights the severity of the consequences for low-income customers, and invites questions of whose interests are ultimately being served, and at the cost of whom. While DPW might be secure in the rational methods that they are using to make certain decisions, lack of transparency regarding how they make these decisions leads to suspicion and distrust, especially given that particular groups of people might be at greater risk of being impacted. According to a series of tax sales clinics organized by pro-bono attorneys in 2015, of 151 participants, 82% were African American, 51% were seniors, and 68% reported an annual income below $20,000 (Graziani and Alexander 2016). Continued marginalization of historically marginalized groups only amplifies tensions, and resembles the descriptions of “permanent minorities” as discussed by Mansbridge et al (2010).

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Within the actions listed in this chapter, planning capital projects, raising water rates, and enforcing collection efforts, the greatest room for deliberation lies in the planning process. Within this process residents and DPW could theoretically take part in an "integrative negotiation" of a "fully cooperative distributive negotiation" by allowing stakeholders the opportunity to provide input, and to come to a common agreement where the parties involved may or may not give up part of they want. This is uncommon in practice, but the case of DC Water in chapter five shows ways in which the planning process can be more deliberative by being transparent.

Because the process for raising water rates concludes with a vote, there is less room for improving deliberation, unless the composition of the board of estimates was to change to reflect a more "equal" vote for each member.

Processes of collections can also expand the role of deliberation with the public, by increasing transparency about how DPW makes choices to enforce collections processes, and by recording and sharing information in what the impacts are.

The next chapter takes a closer look at how customers perceive the utility's actions in light of historically poor performance, and inequitable power structures lying beneath DPWs financial structures.

Chapter V: Citizens Respond to Growing Burdens

On December 3rd 2014, the following headline ran on AFRO media news:

"Advocates Say Efficiency is Equal to Water Privatization" (Cornish 2014)

The article came two days after a public hearing had been held by "One Baltimore United," to investigate the relationship between DPW and Veolia, a private water company, in response to an RFP to conduct an efficiency study of the city's water and wastewater treatment plants. According to a flyer advertising the hearing, the advocacy group was suspicious about any kind of relationship between the city and a company with a track record which included "rate hikes, contract termination, and political interference" (One Baltimore United 2014).

According to the article, Rudy Chow had responded to the allegations by saying that the efficiency study, or external review, was required to deal with the department's overwhelming number of water main breaks – 1000 annually, and could not be done in-house due to and erosion of the utility's institutional knowledge over the years (Cornish 2014).

While the story might sound like miscommunication, the vigor with which advocates worked to end this contract suggests a longer history of standoffs between public residents and officials. In that vein, this chapter aims to understand how Baltimore's residents, advocates, and officials, view the problem of rising water costs by looking at the history of their relationship to these systems and the agencies that operate them, as well as analyzing

public responses to water rate increases at public hearings held by City Council and the City's Board of Estimates. The reasons over which the utility and the public have interacted with one another over the years demonstrates deeper issues with transparency and accountability between the city government and its residents.

Sowing the seeds of distrust through incorrect billing

The relationship of a Baltimore resident and the Department of Public Works often begins with the bill that a customer receives in the mailbox. And for many years, these bills were always false.

Chronic billing issues underlie the fragile relationship between the Department and the public. Although newspaper articles can trace the issue back to the early 2000s, incorrect billing came to light more publicly early in the spring of 2012 after the City Comptroller's office released a billing audit of the Department, looking in particular at fiscal year 2010. The audit examined water bills for 70,000 households within Baltimore City and Baltimore County, and found that over 90%, (65,000) had been overcharged. Of those overcharged, only 17% showed records for any kind of adjustment. DPW conducted their own review of the 70,000 accounts and found that 38,000 had been incorrectly billed, leading to the issuing of $4.2 million in refunds. It is unclear why there is a discrepancy between the audit and DPW's internal review (Scharper and Broadwater 2012a).

Although the audit focused on fiscal year 2010, according to citizen-activist Linda Stewart, incorrect billing had been occurring for several years prior to that. Locally known as

"WaterBillWoman," Linda began collecting information from individual bills in 2006 after she noticed discrepancies in her own bills for multiple properties that she owned in the City. After going through thousands of other bills, she realized that the problem was much wider spread and tried to raise the issue with city officials with little success. City officials only turned their attention to the issue and pushed for the audit after the City Comptroller's staff, and then the Comptroller herself, received unusually high bills upwards of $800 (Broadwater 2012).

Compounding the problem of incorrect billing, were lengthy dispute processes. If a resident wanted to dispute a bill that they believed was incorrect, they had to schedule an administrative hearing, also known as an "informal conference" by calling DPW's customer service number, and waiting at least two weeks after the request was received. According to archived information from DPW's website, customers were allowed one conference a year per property. If given a conference, customers had to bring supporting information including the bill in question and plumbing receipts which proved that there was no leak on the property or in the house contributing to the high bill (DPW, n.d.).

Searches for DPW assistance online leads to multiple forum threads where residents ask each other questions about the best way to resolve a bill dispute ("How to Dispute a Water Bill?" 2017). Details from each case provide insight into customer experiences with attempting to negotiate bills. As an article from 2015 elaborated, while extravagantly high bills might be resolved quickly, others are not as fortunate. For instance, in one case, a resident received a $60,000 bill for her row house that was not only an incorrect amount,

but for an incorrect billing period. When looked into, the case seemed to be a result of human error, and given the extravagant amount, was resolved fairly quickly. But many more received bills that were perhaps only double or triple their regular amounts, in the range of $600 to a few thousand dollars, in some cases even triggering homes to go into tax sale for bills that were incorrect (Sweeney 2015). After the audit in 2012, advocates pushed for a moratorium on tax sales for unpaid water bills while the billing system issues were being addressed, leading to an unanimously approved City Council resolution on the matter. Although the resolution was approved, it was nonbinding and did not carry the authority of a law in the same way that a legal ordinance would. Then Mayor, Stephanie Rawlings-Blake, voiced concerns over ending the practice of tax sales because it could harm the City's bond rating (Scharper 2012).

Another article from 2014 used information from a DPW spokesperson to estimate that about 1300 people were receiving adjustments to their bills during every billing period, averaging at about a hundred at every informal hearing (Ericson 2014). Given the number of people who have had to request adjustments, it was not uncommon to hear about negative experiences during the process. As the Brew article from 2015 quotes a resident as saying:

"The consensus was, they [the water department] will try to do everything to blame you" (Sweeney 2015)

When asked about whether they had to deal with incorrect billing issues, both Councilman Cohen and Henry admitted that their offices served as proxies for residents to complain or seek advice on incorrect water bills. As Councilman Cohen said:

"Service is part of the job. But, we're a legislative body. We should be doing laws. Not customer service. Not correcting 311. That needs to change" (Cohen 2018).

DPW responded to the increasingly negative press with plans to increase their staff and upgrade their billing system. After the 2012 audit and subsequent refund, DPW claimed to "triple" the size of the staff that fielded customer complaints. Before then, only seven employees handled all complaints for a system that served 411,000 households (Scharper and Broadwater 2012a). The Sun also reported that in 2006, the department slashed the number of people who read meters in the city and the county from 52 to 28, which seemed to add fuel to the assumption that most bills at the time were based on estimations rather than actual meter readings (Scharper and Broadwater 2012b).

In addition to staffing changes, DPW began a plan to revamp the metering and billing system which was about 40 years old at the time. After spending two years, and over $14 million on implementing a new billing system, the "Baltimeter" program was finally rolled out in the October 2016 (Broadwater 2016b). The new program offered improvements like monthly billing periods rather than quarterly billing periods so that people could become aware of leaks or spikes in their water bills earlier, and reduce the likelihood of disputes (DPW 2016d). The new system was also accompanied by a new fee structure such that

residents were no longer charged minimums regardless of consumption, and flat fees were added for “administration” and “infrastructure” (see the Baltimeter fact sheet and sample water bill in Appendix F and G).

Although citizens recognized and appreciated the herculean task of updating the system, some wondered why the problem had not been addressed earlier, claiming that officials had been aware of the issue for a long period of time. Some questioned whether the accuracy of the new meters would live up to the hype, or simply fail. For some, this cynicism would be confirmed as news of incorrect bills came out yet again after the rollout (Broadwater 2018). But it is unclear whether these errors were due to the new system, or simply an issue of transferring from one system to another. Again, both Councilman Cohen and Henry suggested that the number of calls from constituents regarding billing issues had decreased since the overhaul. According to Cohen: “Obviously whenever you roll out a new program like that there's going to be hiccups along the way. So we heard at first a lot of complaints about inaccurate water bills. Those have declined pretty significantly, dramatically since then” (Cohen 2018).

Still, those who continue to get incorrect bills are having to face additional challenges from changes in the dispute process. Since the new system also removed the informal conference process in favor of an on-line process, frustration continues to build among residents and officials who, even though they were not fans of the earlier process, argue that an independent arbiter provided much needed confidence in the fairness of the process. Many city officials are now working to reinstate informal conferences, including councilmember

Mary Pat Clarke, who emphasized the importance of the old process in a 2017 article from the Sun:

""You would have a neutral hearing officer that doesn't work for the agency, which is very important…This gives people a chance to be face-to-face with a person" (Wenger 2017).

Given that the larger consensus amongst residents is that the DPW will try to blame incorrect water bills on residents first, despite the numerous times that they have been proven wrong in the past, it is understandable why a face-to-face meeting with an independent mediator would help to assuage people's fears and general distrust. But the need for such arbitration also signals that there is a much longer road ahead.

Perception of unfairness as rates continue to rise

In the fall of 2016, at a public hearing organized by Councilmen Bill Henry and Carl Stokes, incorrect bills and issues with the new billing system came to a head with another issue that had been brewing on the ground since 2002: increasingly unaffordable water rates.

According to an interview with councilman Bill Henry in January 2018, a public hearing on the affordability of water came together after he was approached by advocates regarding the issue of water affordability (Henry 2018). Although he could not remember who exactly approached him first, he recalled the fact that was presented to him, the fact that he used to write the resolution to convene the public hearing, and the fact that he read aloud to open the public hearing on October 26th, 2016:

"The United Nations Development Program set a threshold for affordable water and sanitation service at 3% of household income. That is a worldwide standard. The global standard that the United Nations expects every country to be able to meet. As of July 2015, the typical household in Baltimore pays about $892 a year for water and sewer service, which would constitute at least 3.6% of the annual income for households that earn less than $25,000 a year. So if you make less than $25,000 a year, you are probably paying more than the UN global standard for water. One-third of city households, make less than $25,000 a year" (City Council 2016).

Although Councilman Henry and other advocates used global statistics and best practices to open the discussion on water affordability standards, testimony from individual residents made it clear that they were not there to talk about statistics. Residents felt increasingly burdened by their water bills, and they were trying to understand why they were the ones having to face this burden. The perception of this burden was not based on the percentage of their income that was being spent on water, but rather a comparison of their different expenses.

One customer compared his bill to his mortgage payment, calling the three-month sum of his quarterly bill "breathtaking." Another customer, Caroline Wainwright, reminded the council and the audience that water bills were part of a larger bucket of expenses that residents were finding increasingly more difficult to meet, especially on fixed incomes:

"[Seniors] are not exactly poor but we're not wealthy either. We retired at a time when our incomes weren't very high. So we are living, pardon the pun, just to keep our heads above water" (City Council 2016).

It quickly became clear that residents wanted more information to understand why this was happening. Why were their neighbors who were serviced by the same system, but living across county lines, receiving water bills with lower amounts? Why were residents receiving shutoff notices more often than businesses? When were the rate increases going to stop? And was there any place to acquire the money other than on the backs of citizens?

Residents vs. Businesses

In regards to the perception that businesses were being treated more favorably than residents, the hearing was not the first time that this issue had come up. Articles from 2015 describe an uproar in response to DPW's increased shut off enforcement, due to reports that, during the first six weeks of enforcement, the majority of 1600 shut offs had taken place in residential neighborhoods of Baltimore County, even though more than 350 large commercial accounts accounted for $15 million (about 38% of the total) in unpaid water bills (Broadwater 2015b).

However, data received in 2018 shows that only 11% of uncollected debt in 2015 was from meters that were more than 1.5" in size (DPW 2018b). Given the understanding that residential account meters tend to be 1" or less, there seems to be some discrepancy

between the data that the Sun disclosed in 2015, and the data that the agency disclosed in the public data request in 2018.

While there are legitimate questions around what might have been going on in 2015, perceptions of unfairness amongst residents and City officials can be traced back to 2010. During a Board of Estimates Hearing in 2010, the City Comptroller brought up a report which claimed that some large water meters had not been checked for over 20 to 30 years, leading to questions about how businesses were being billed, if they were being billed at all. DPW responded by verbally reassuring the Board that all commercial accounts were being billed (BOE 2010). In 2013, businesses came up yet again when a financial audit revealed that four commercial accounts with outstanding balances of $7.3 million were undergoing bankruptcy proceedings, through which the utility hoped to recover the fees (BOE 2013).

With this history, it is unsurprising that in 2015, Councilman Carl Stokes, the same councilmember who would later chair the affordability hearing, said: “It's absolutely wrong to nickel-and-dime the average taxpaying resident and allow the business to get away with not paying for long periods of time" (Broadwater 2015b).

Activists staged protests in the wake of the increased shut offs, and made clear demands that the collection practice should be enforced on businesses before residents, if it had to be enforced on residents at all (Broadwater 2015b).

According to the article, DPW did not provide a clear response as to whether or not businesses were being subject to shut offs the same way that residents were, but the article does claim that DPW had increased shut offs on residents to make up for the years since 2012 when DPW officials had stopped shut offs due to the City audit over DPW's incorrect billing. The reinvigoration of this practice was deemed necessary to "stop freeloaders from taking advantage of the system." No such similar statement was made about "freeloading" businesses (Broadwater 2015b).

At the 2016 hearing, DPW attempted to respond to similar complaints about the prioritization of commercial accounts over residential accounts, by saying that the worst offenders in terms of large unpaid bills were actually multi-unit buildings, and that the agency was now trying to target these large properties instead of individual residences (City Council 2016). Shut off data from 2016 and 2017 support DPW's claims that the number of shut offs have decreased, but because the agency does not share information on the types of accounts that were shut off, it is impossible to tell whether their strategy for targeting enforcement has changed, or if the decline is for another reason.

Tenants vs. Landlords

The hearing also brought together advocates who had noticed that water affordability issues were amplifying the consequences of problematic power structures between tenants and landlords. Noah Patton, a representative from the Homeless Person Representation Project, indicated that residential landlords were increasingly passing on rising water costs to their tenants (City Council 2016). As Zafar Shah of the Public Justice Center pointed out,

tenants do not control their own accounts in DPW's system, and without the landlord's permission, tenants lack access to information and the ability to participate in billing disputes when needed. Many times, they have been locked out of the informal conference process, or treated like a third-party at best. Although DPW claims that tenants can gain access by presenting their lease, many residents do not have written leases, or suffer at the hands of landlords who withhold the official documentation from them. If a disputed bill is not resolved and results in a water shut off, the lease agreement has technically been violated and the landlord can start eviction proceedings (City Council 2016).

Even more ominous, Zafar Shah's testimony pointed to the fact the incentive structures for landlords are set up such that evicting a tenant is faster, and therefore more convenient than disputing a water bill:

"When a landlord can choose whether to be involved in an informal conference which can take weeks or months, or they can choose the district court's rapid, fast, cheap, process to evict somebody, or to use the eviction judgement as a way of squeezing money out of the tenant, even though they've disputed the water bill, they're going to pick district court every single time. The financial incentive they have, the business incentive they have, is to go through a process where they file on day 1, and they get a possessory judgement within 14 days."

While DPW does not refute that tenants might face problems with their landlords, the only information that provide on their website is the following:

"If you are a tenant and your name is not on the water bill, our staff cannot provide you detailed information about the requested location. Please contact your landlord, management company, or if you have issues with your landlord, Maryland Legal Aid"(City Council 2016).

DPW does not provide any assistance to renters, and in fact, passes on the problem to legal agencies that are already having to deal with thousands of similar cases a year. In fact, a study published by the Public Justice Center in 2015 indicated that over 6000 renters are evicted every year in Baltimore. Most of these renters are living in poor conditions, including plumbing leaks, which lead to disproportionately high water bills (Broadwater 2015c).

Given these dynamics, tenants are clearly vulnerable to DPW's account structure and likely to continue facing the brunt of rising costs, where the risk is not only a water disconnection, but eviction and homelessness.

City vs. County Residents

The issue of City bills and County bills came up numerous times during both the City Council hearing and the Board of Estimates hearing in 2016. Although DPW is in charge of accounts in Baltimore City and Baltimore County, the payments are processed differently in both jurisdictions. One resident admitted that it might be a case of perception rather than reality, but she was "very, very, suspicious" that her friends who lived in other counties

received water bills that did not look like hers (City Council 2016). Although not present at the hearing in 2016, Councilman Zeke Cohen confirmed this perception amongst his constituents during our interview, saying: “They are frustrated that our bills seem to be so much higher than neighborhoods that border the city…. folks will say to us, why is my water bill twice what my neighbor who's two streets up is paying over there?”(Cohen 2018).

Transcripts from the 2010 and 2013 Board of Estimates Hearings on rate increases reflect similar concerns.

DPW customer service representatives who attended the hearing responded to such complaints by explaining that some counties did not pay for sewer services, and that their infrastructure fees were baked into their property taxes, and therefore their total amounts were lower (City Council 2016). DPW representatives offered similar responses at the 2010 and 2013 Board of Estimates Hearings on rate increases, after the issue was brought up on both occasions (BOE 2010, 2013).

As seen in the figure below, information online confirms that the city and county rates are comparable. However, access to this information remains difficult. A quick scan of DPW’s main menu reveals a page on “water bill rates and fees” under water billing information. A note on rates for customers outside the city reminds the customer that Carrol County and Harford County purchase raw or unfinished water, and each jurisdiction sets its own rates. For Baltimore County, the DPW directs customers to Baltimore County’s website. Only if

one enters a search on a search engine with the title “Baltimore city versus county rates,” does a page pop up with the following information:

Table 11: City vs. County Billing Methods and Rates for FY 2016 (DPW 2015c)

City of Baltimore

City v. County Billing Methods and Rates

FY 16			
		Baltimore City	**Baltimore County**
Water	Usage Charge	$380.69	$140.53
Water	Distribution Charge	$0.00	$112.83
Water	Front Foot Assessment	$0.00	$120.00
		$380.69	$373.36
Sewer	Usage Charge	$511.73	$381.36
Sewer	Front Foot Assessment	$0.00	$200.00
Sewer	Bay Fund	$60.00	$60.00
		$571.73	$641.36
Stormwater	Single Family (820-1,500 Sq.Ft. City / Detached home County)	$60.00	$26.00
Total		**$1,012.42**	**$1,040.72**

Given that many customers may not even get to the point of looking this information up online, the navigation required to get to this page for someone who does wish to find out more, demonstrates a certain lack of desire or awareness on the part of the department to make this information easily available.

Still, even if the information was more readily available, it might not undo the perception of unfairness amongst City residents who feel like their cost of living is altogether higher than that in the County. As Councilman Zeke Cohen explained in an interview:

"People who live in the city think that, what is true, is that we pay a substantially higher property tax, largely because we have a much higher degree of concentrated poverty due to all of the middle class flight and white flight that happened…people were essentially incentivized to move out of cities like Baltimore and into the surrounding suburbs, taking their taxes with them. In some cases, they still work in the City and live in the County and pay their taxes back to the County, even though they're using our roads, and our services. So I think there are definitely some tensions there" (Cohen 2018).

As councilman Cohen's remarks indicate, the history of tensions between the City and County is strong and rooted in historical patterns of suburbanization which eroded the City's economic base, and disproportionately impacted a lower-income, less mobile, black population. Although the breakdown provided on DPW's website "proves" that City customers pay about the same amount for water and sewer services, the fact that Baltimore County's sewer rates are combined with their taxes leads to greater confusion and suspicion because City residents are paying more than County residents in taxes. For customers, the present case of water and sewer bills is not simply an issue of administering costs differently in two different jurisdictions, but rather a reminder that, overall, they are being charged more for living in the City.

Rising Frustrations and Demands for Accountability

By the time the hearing occurred in 2016, prices for water and wastewater had been increasing for over 15 years. In addition to concerns over the persisting inequalities described above, residents at the hearings also shared their frustration at the fact that the increases showed no signs of ending anytime soon.

Citizens demonstrated frustration with the never-ending rate increases, and used the hearing as a platform to ask City Council and DPW representatives when the rate changes would stop and why citizens were having to bear all the costs. As one customer asked:

"My question is, once we get this infrastructure started, is the water bill going to continue to go sky high? Number two, is there places to acquire money other than the backs of the citizens of the city of Baltimore? We need to first apply grants to the federal government, to help us with the infrastructure. We need to apply grants to the state of Maryland, to help us with the infrastructure. Because we, the citizens, especially the senior citizens have been the backbone of Baltimore city. We pay taxes on everything we do" (City Council 2016).

Representatives from DPW did not offer any concrete responses about the question of when the rates would stop increasing. They did remind the audience that these increases were meant to finance the infrastructure upgrades that the city desperately needed, and that although they were making attempts to generate revenue through grants at the state and federal levels, those sources of funding were not enough to sustain operations (City Council 2016; BOE 2016).

But Kim Trueheart, a local activist and one-time challenger of City Council President Jack Young, did not buy the response. She pointed the blame at Ordinance 941 and its requirement for the utility to be self-sufficient:

"The ordinance says that it will be self-sufficient, this utility. Which means that the rate-payers get to pay for everything that the utility decides to do. Now who's making decisions, about what the utility does? Mr. Chow makes those decisions. Very independently. Now I have a problem with the fact that the DPW Director gets to set the program agenda, gets to prioritize the agenda, and then he gets to turn around and tell us how much we're going to pay for his agenda" (City Council 2016).

Trueheart's comment gets at the heart of many resident's frustrations who do not understand why costs are increasing, or, if they do understand the one-time nature of capital investments, do not understand why they have to bear the cost of past and future generations of customers. But most of all, her comment reflects a perception that it is unfair for customers to be assigned the responsibility of servicing a large system, without making the Department adequately accountable for its decisions.

Derek Jones, another resident who spoke at the 2016 Board of Estimates Hearing, also brought up questions of transparency in the rate setting process:

"I do want to try and see where I missed the point of you guys been a little more transparent and how you disclosed or either presented to the customers and the citizens how you come up with these rates. Before you propose increasing in rates and adding fees, what have you done to reduce expenses? Has there been an outside audit conducted?" (BOE 2016).

Independent audits were brought up more than once at the BOE hearing, as another resident, Charlene Cowen said:

"City residents are expected to dig deeper into their pockets and shell out more and more money for water bills that seem to increase steadily with no relief in sight while DPW skips the mandated audits for another year…Let's trim the fat off DPW's budget and tighten their belt just like residents are being asked to tighten ours" (BOE 2016).

Although audits have been conducted for DPW in the past, the robustness of these audits has been questioned multiple times by residents and members of city council, and the degree to which these audits are publicly disseminated, or accessible, is unknown (Broadwater 2016a).

For Trueheart, there is only one clear solution to issues of transparency and accountability, and it is the same solution that she recommends for the police department, both of whom she believes are "screwing over" Baltimoreans: civilian oversight (City Council 2016).

Political Responses and Standoffs: Government vs. The People

After the Affordability Hearing, the coalition, along with Bill Henry, decided to introduce legislation at the city level during the following legislative session in 2017. Based on the issues that were brought up at the hearing, the bill would have two parts, one that addressed the affordability issue by introducing an income based rate structure, and one that addressed the accountability issue by introducing an "Office of the Water Ombudsman" who would serve as an independent third party to resolve water bill disputes (Eckell, Vaidya, and Heddon 2018; Henry 2018).

When City Council President, Jack Young, became aware of the issue, he decided that he wanted to be the lead sponsor on the bill. Despite Young's interest in the bill, his staff made little to no progress in actually drafting any legislation. When Councilman Henry decided to take the initiative of drafting something, Councilman Young threatened to walk away from co-sponsoring the bill, which, in Councilman Henry's opinion, was "not even quite veiled code for 'and will work to kill yours'" (Henry 2018). Meaning that Councilman Young was threatening to kill Councilman Henry's bill, while introducing one of his own. In the best case, both bills would be identical in content, but with different sponsors. More likely, Councilman Young could introduce a much more diluted version of the original bill (Henry 2018).

When pressed about why Councilman Young would demonstrate an interest in the bill and then stall the process or work to pass a stripped-down version, Councilman Henry suggested that Councilman Young's primary interest in the bill were the parts that dealt

with accountability of DPW rather than affordability of water. With the DPW's history of poor billing across the city, a bill addressing the agency's lack of accountability was likely to draw support from all segments of the city, not just the geographically concentrated cores of low income residents who would benefit from income based billing (Henry 2018).

Because Councilman Young posed a direct challenge to the bill as Councilman Henry and the Coalition had envisioned it, Councilman Henry decided to hand over the bill to Councilman Young's staff and let them take the lead on drafting the original version, with equal parts affordability and accountability, instead of challenging it with his own bill which would most likely be defeated (Henry 2018).

As of March 2018, the bill had still not been introduced. Councilman Henry and others suggested that Councilman Young wanted the bill to be perfect upon introduction, meaning that he did not want to negotiate with the Mayor's office, or advocates, or DPW, after introducing the bill. He wanted all such negotiation out of the way such that the introductory version of the bill passed (Eckell, Vaidya, and Heddon 2018; Henry 2018).

While that could be appreciated as one strategy to ensure the passing of the bill, Councilman Henry worried that the tactic was simply another attempt at stalling any introduction. While he admitted that he'd love to be wrong and see the bill pass in 2018, he said: "at this point I'd be hesitant to put money I couldn't afford to lose, on that outcome" (Henry 2018).

Certainly, there are reasons to worry that the bill might not pass. DPW has continued to raise concerns that an income based structure is not revenue-neutral, meaning that the new structure might reduce DPW's revenues compared to the structure that is currently in place (Henry 2018). Proponents of income-based billing have argued that when bills are affordable, people are more likely to pay them, reducing unpaid bills, and ultimately benefitting the utility (Colton 2017). Given that Philadelphia is the only city in the country to have implemented this structure as of 2017, utilities like DPW are still hesitant to follow suit before seeing at least a few years of numbers proving that the structure is fiscally beneficial (Eckell, Vaidya, and Heddon 2018).

DPW also argues against changes to the rate structure based on the fact that it offers customer assistance programs to help those who cannot afford higher rates. However, as discussed in the previous chapter, enrollment rates in these programs remain low. DPW admits that outreach for such programs is always a challenge, especially given the "transient" nature of many customers (City Council 2016).

Some argue that it is not an issue of revenue neutrality or customer assistance, but rather an underlying philosophy on the part of government officials who think that the reason this problem exists is because lower income people don't want to pay their bills. Because of this, income based affordability programs appear to be subsidies for people who don't deserve them. One advocate recalled how a councilman had said that income-based billing was a "punishment" for everyone who made enough money to pay their bills (Eckell, Vaidya, and Heddon 2018).

Within this politically charged debate, even if an affordability bill passes, it is unlikely that a bill alone will repair the confrontational relationship between DPW and Baltimoreans. Indeed, this relationship is a microcosm of a much larger broken relationship in the city, that of the government versus the people.

For many residents who attended the water affordability hearing as well as the Board of Estimates rate-setting hearing, their grievances went beyond issues of water, to issues of democratic representation. As the following quotes illustrate, many believed that their representatives were far too disconnected from the issues of their constituents:

"I think that when laws are passed, you all are not living in the same atmosphere that we are" (BOE 2016)

"You all just sit here looking at me like I am from another planet. I am not – I'm a taxpayer and I pay your salaries" (BOE 2016)

Certainly, the City is facing issues greater than just infrastructure failure and costs. According to a ten-year financial plan for Baltimore, released in 2013, the City finds itself at a turning point. It is still trying to stabilize after the financial hardships it experienced during the recession, as well as long term economic decline, and much of the new economic strategy is dependent on attracting and growing the City's population. The weaknesses, as

seen by the city, include crime, poor public schooling, gaps in workforce skills, and aging infrastructure (Mayor Rawlings-Blake 2013).

What the report does not mention, are the racial conflicts underlying much of these weaknesses. The black population feels targeted, not just by decades of disinvestment, but especially by the government's response which has attempted to govern pockets of poverty through increased policing, as the Freddie Grey protests illustrated (Smith 2017). As mentioned in an earlier chapter, the city spends as much of its operating budget on the police department, as it does on public works, which is significantly more than it spends on services like education or housing (Office of Mayor 2017). While the evidence presented in this section cannot draw any conclusions to how different social and economic issues are linked, quotes from residents demonstrate the fact that while City Department's like Housing, Finance, and Public Works might think of issues in silos, residents experience the interconnectedness of these systems through the challenges that they face. Therefore, although the City government may hold public hearings to discuss a specific issue like water rate increases, citizens who attend the meeting, are likely to respond as such:

"I worked real hard to get my home and I have been fighting a lot of issues in this City for years that's been unfair to me and my family and other people like me" (BOE 2016).

For a city that had seen the aftermath of Freddie Gray's death only a year prior to these hearings, it is unsurprising that for residents, issues with a basic service like water were only another indicator of how the government had failed them. While some, like Trueheart,

are willing to fight the establishment as they see it, others simply wonder if they should surrender. As one resident put it:

"Are you going to regulate our breathing and give us equipment or breathing apparatus next? I don't understand it. You guys got me with my hands up" (BOE 2016).

The powerlessness of citizens in the face of ineffective governments is exactly what proponents of deliberative democratic reforms attempt to address. Fung and Wright (2001), argue that democracy in the twenty-first century has come to represent a narrow set of functions, based on territorially based competitive elections of political leadership for executive and legislative offices. This is a far cry from the central ideal of democratic politics, which attempts to facilitate active citizen involvement, forge consensus through dialogue, and devise and implement public policies that form a productive, healthy, and equal society (Fung and Wright 2001). Based on the fiscal and social challenges that have been highlighted in the previous three chapters, the context in Baltimore is similar to contexts in other cities that have attempted deliberative democratic reforms, like Chicago, where frustrations with poor schooling led to the formation of neighborhood governance councils (Fung and Wright 2001). However, existing literature seldom provides examples of similar reforms in the water and wastewater sector. Given this limitation, the next chapter explores opportunities to use deliberative democratic reforms to address some of the challenges underlying the broken relationship between DPW and its customers.

Chapter VI: Potentials for Improvement

Experiences from developing countries in urban water and sanitation issues demonstrate a tendency for governments to respond to challenges in this sector by changing the ownership of water agencies from public to private. The impacts of these decisions has generated a wealth of literature on the benefits or challenges of public versus private ownership in the area of water and wastewater provision (Bakker et al. 2008). The United States favors publicly-owned water utilities in its large cities, with public versus private ownership standing at about 85% versus 15% of the population at present. With the current infrastructure crisis, private players, like the international water conglomerate Suez, have moved into the picture, going as far as sending lobbyists to cities such as Baltimore on a weekly basis and offering leasing options to the city if they simply want to back out of running the system themselves (Broadwater 2017).

On this one topic, both City officials and advocates surprisingly agree. Neither is interested in private ownership of the utility at the moment (Cohen 2018; Eckell, Vaidya, and Heddon 2018). Still, that does not change the fact that the utility is facing financial constraints, and citizens are concerned that the utility's responses are placing an undue burden on those who are unable to pay. Absent of regulation which forces the utility to end certain punitive practices which lead to inequity, this chapter looks to deliberative democratic traditions in order to reconcile both utility and citizen concerns.

Deliberative democratic tradition suggests that transforming the situation in an environment with diverse interests requires acknowledgment of self-interest on all sides (Mansbridge et al. 2010). While earlier chapters have identified DPW's interests in improving their financial conditions, the question that needs to be considered is: Is it in the utility's interest to address the public's concern over issues of equity? And if so, what kind of reforms could serve the greater interests of DPW, while addressing the public's concerns?

Valuing the Customer: The Case of DC Water

Many utilities face technical and financial challenges similar to Baltimore's DPW. In an effort to understand what utilities are doing beyond rate increases to engage with customers while continuing to address technical and financial issues, this section looks at the case of DC Water.

DC Water is unique, because their customer strategy more closely resembles that of a private corporation fighting for customers, rather than a public monopoly attempting to appease customers. In the words of George Hawkins, DC Water's recently retired leader:

"I became convinced that we had to become as good at customer relations as Nike or anyone who has to fight for a customer. As a monopoly, we don't have to fight for a customer. But our customers have the ultimate power over us. My wish was that if I asked for $5, our customers would say, 'How about $10?'" (Bloomberg Cities 2018)

Between 2009 and 2017, George Hawkins transformed DC Water's public image from that of a utility that was facing the aftermath of a lead crisis, to one that has been heralded as a global leader in the water and wastewater industry. The words "fearless," "celebrity-like," and "charismatic" have all been used to describe a leader from an industry that few outsiders normally take notice of (Farr 2017; Sloan 2017). So when George Hawkins preaches the importance of customers, it begs the question, how, to what end, and to what extent, has DC Water accommodated customers, while achieving its larger goals?

DC Water's "Blue Horizon 2020" plan, adopted in 2013, provides some insight into the utility's overall strategy towards becoming "a world class utility," and how customers are viewed within that. In it, the utility develops nine overarching goals, and within each goal, there are a list of objectives and initiatives. Each goal is assigned to a committee and each committee is led by a "goal champion" (DC Water 2013).

A table of the updated goals (as of 2015) and their respective committees can be seen below.

Table 12: DC Water 2020 Strategic Plan Framework (DC Water 2015)

Goal		**Committee**[6]
1	Develop, Maintain, and Recruit a High Performing Workforce	Human Resources/Labor Relations Committee
2	Collaborate Locally, Regionally, Nationally, and Internationally	Governance Committee
3	Increase Board Focus on Strategic Decision	Strategic Planning Committee

[6] In DC Water's 2017 Annual Report, all of these committees are mentioned as standing committees except for the water quality and water services committee. It is unclear if this committee's work has been absorbed by the others, or if it hasn't been formed as of 2017.

4	Enhance Customer and Public Confidence, Communications, and Perception	DC Retail and Sewer Rates Committee
5	Promote Financial Sustainability, Integrity and Responsible Resource Allocation	Finance & Budget Committee
6	Assure Safety and Security	Water Quality and Water Services Committee
7	Consider DC Water Role in Drinking Water Treatment	Water Quality and Water Services Committee
8	Optimally Manage Infrastructure	Environmental Quality and Sewerage Services Committee
9	Enhance Operating Excellence Through Innovation, Sustainability, and Adoption of Best Practices	Audit Committee

As the table demonstrates, two of the nine goals concern managing customer relations and customer responsibility in the utility's financial operations. Goal 4 aims to increase customer satisfaction and improve public understanding and support of DC Water's challenges. Goal 5 aims to achieve an affordable and fair rate structure, in addition to preparing budgets, and meeting other fiscal goals.

Meeting minutes from committee meetings are available online and offer some understanding of what these goals look like in practice. For instance, while developing their current 10-year Capital Improvement Plan (CIP), Matthew Brown, the utility's Chief Financial Officer conducted multiple rounds of meetings with the Board of Directors and each committee during January and February 2018 to produce a plan that promoted asset management principles while addressing customer affordability. According to these minutes, it is apparent that the Environmental Quality committee pressed for Brown to include a definition of customer affordability in the plan, and Reverend Curry from the Rate committee voiced his concern that the utility's outreach program needed to be more robust (DC Water 2018a, 2018b). In March of 2018, ostensibly after incorporating feedback from

earlier meetings, Brown presented the following "Path to Achieve Asset Management":

1) Exploring investment in infrastructure (Environmental Quality Committee)
    a. What is needed to fully meet asset management principles?
    b. What are our peer utilities doing?
2) Exploring alternative sources of revenue (Finance and Budget Committee)
    a. What funds could be available, other than from ratepayers?
3) Community outreach and education (Retail and Rates Committee)
    a. Explain infrastructure investment, and consequences of investment
    b. Gather ideas about addressing affordability
4) Impact on the financial plan (Finance and Budget Committee)
    a. What is the impact on the operating budget, and what is the impact of pro-active investment as compared with addressing issues as they arise?
    b. What could be financed through debt?
    c. What are appropriate levels of PAYGO?
5) Customer affordability (Retail and Rates Committee)
    a. What ways can we help ensure affordability?
    b. What are our peer utilities doing to meet this challenge?

At the end, the presentation also makes clear that committee reviews and discussions are intended to ensure optimization, accountability, and transparency throughout the budget preparation process (DC Water 2018c).

Looking at the above plan and the availability of the minutes provides a strong indication that the utility is prioritizing a transparent planning process such that customer input is not simply limited to feedback once the decisions have already been made. It also demonstrates that DC Water is considering customer affordability in conjunction with other questions that serve the utilities interests, such as their infrastructure investment needs. While DPW's integrated planning framework suggests that Baltimore aims to include stakeholders and consider feedback from the community in conjunction with their capital planning needs, there is no publicly available documentation which would provide evidence of DPW putting that desire into practice.

DC Water has received other votes of confidence in their transparency and performance as well, as demonstrated through an "independent engineering inspection" report from 2018. The report is part of a five-year recurring audit of the current state of facilities and DC Water's initiatives, as required by DC Water's Master Indenture of Trust. For the 2018 report, DC Water retained Johnson, Mirmiran & Thompson, Inc. (JMT) to conduct an independent assessment. The report notes:

"The 2018 Assessment was conducted during a period in which DC Water has undertaken innumerable projects and initiatives. The scope and ambition of these efforts are notable both within the history of DC Water and within the overall water utility industry. During the intervening period, comprehensive and aggressive construction activities continued to meet scheduled milestones for Consent Decrees (CSO-LTCP & TN/WW) and NPDES permit requirements. While many construction projects were commissioned in response to the

mandates of regulatory orders, consent decrees, and permit requirements, other organizational initiatives have been undertaken in the interest of increasing efficiency, improving management and operations, and significant improvements in customer service" (Johnson, Mirmiran & Thompson, Inc. 2018, Pg. 10).

The assessor from JMT attended a committee meeting, in addition to a number of other methods employed for the assessment, and found that it demonstrated "organizational transparency" and "sound reasoning." In the absence of direct quotes from residents, this independent assessment provides some assurance that DC Water is meeting its desired goals of being transparent, while advancing the utility's own efficiency and operational improvements.

However, despite efforts to promote affordability along with efficiency, DC Water has not been completely immune to negative perception from customers. One headline from December 2017 reads: "Outgoing DC Water CEO Raised Agency's Profile, But Faces Criticism Over Fee Increases" The article picked up on discontent from churches and cemeteries who felt that they were being unfairly impacted by one of the new fees that was meant to help pay for the Clean Rivers Project, a $2.6 billion endeavor, based on the impervious area of a landowner's parcel (Fenston 2017).

Given the information, it is clear that DC Water is continuing to lean on customers for a large part of its revenue through rate increases and fees, but the utility is also aiming to

maintain a transparent process and produce evidence of good performance that is clearly visible.

There are a number of ways in which DPW could dismiss DC Water's approach, by claiming that DC Water is not facing the same financial or organizational pressures. The median household income in DC is closer to $72,000 (ACS 2016 5-year estimate), and DC Water is independent of the District of Columbia's government, which gives it more autonomy. DC Water therefore has the luxury to respond to challenges in different ways. But DC Water's experiences can still hold lessons for organizations that are dealing with public relations challenges, which forged much of the organization's strategies that have been described above. When George Hawkins became General Manager, he and the rest of his team had to deal with the fallout of a lead crisis that emerged in 2004 and broke the public's trust in the organization. According to one article:

"[In 2009] By the time Hawkins took over, Johnson had successfully overhauled WASA's operations and made improvements…The problem was public perception" (Shin 2011).

Given the similarities in problems of public perception, and the success that DC Water has experienced since 2009, DPW might care to take notice of a peer organization that follows a philosophy where transparency, accountability, and efficiency are not always at odds, and sometimes even aligned.

Transparency and accountability

Transparency and accountability (T/A) initiatives have become fairly popular interventions in public administration circles, with the aim to improve public deliberation and accountability of public officials. The most familiar form of transparency within this realm is "Freedom of Information" (FOI) or "right-to-information" legislation, which allows citizens to demand information from public agencies. While this type of transparency is familiar, some have commented on its limitations in actually holding officials accountable (Kosack and Fung 2014). More recent forms of transparency fall within a bucket of reforms known as "targeted transparency," which aim to reduce specific risks or performance problems through selective disclosure by corporations and other organizations (Fung, Graham, and Weil 2007).

Kosack and Fung (2014) provide a summary of different kinds of transparency, based on different kinds of "targets" and "users," where targets include governments or corporations, and users include self-governing citizens or individual customers and beneficiaries. The authors then develop five groupings, or "worlds" of informational, market, and political conditions that link transparency to improved public services through different pathways. Within these five worlds, the third and fifth world most closely resemble the governance structures that have led to Baltimore's affordability issues. In these worlds, little competition exists for a service, and either the provider is unwilling to cooperate, or both the provider and the users are unwilling to collaborate. The authors argue that when the providers are the only ones unwilling to respond to calls for reform, then transparency and accountability initiatives must shift the balance of power between

citizens and providers so that providers find it difficult to ignore the costs of their disregard for the quality of care available to citizens (Kosack and Fung 2014).

In addition to developing methodologies for transparency reforms based on governance models, Khagram et. al. (2013) conduct case studies to understand the effectiveness of specific policies that have already been put in place. For fiscal transparency initiatives, the authors argues that the evidence linking increased fiscal transparency with increased accountability is scarce (Khagram, Fung, and de Renzio 2013).

In terms of public service provision, studies a little more hopeful. Fung, Graham and Weil (2007) cite a few successful cases including home mortgage loans and education. Through the Home Mortgage Disclosure Act (HMDA) in 1989 and 1992, Congress strengthened requirements that banks report on their mortgage loans according to the race, gender, and income level of borrowers in each geographical area they serve, to address housing concerns in urban neighborhoods. To address education issues in 2011, Congress stated that federal aid should be provided on the condition of school performance. The authors are careful to note that in cases like these, markets and deliberative processes alone did not produce the information that people needed, so greater government intervention was required (Fung, Graham, and Weil 2007).

Ultimately, the literature suggests that three questions need to be asked when assessing the potential effectiveness of transparency policies: Who uses information and engagement opportunities when they are made available? What purpose is the information used for?

And what broader benefits accrue from this engagement for the users or society as a whole?

The following section attempts to build a list of recommendations for DPW, keeping in mind lessons from DC Water that emphasize how transparency, accountability, participation and other forms of citizen engagement can repair relationships between the utility and the public, while also improving efficiencies for the utility.

Charting a course forward

Promoting Transparency and Accountability

In recognition of the finding that transparency and accountability initiatives work best when the purpose is clear, and that deliberation requires identification of self-interest for all parties, this section recommends a list of initiatives that promote transparency and accountability, while working towards greater financial and technical efficiency for the utility, and greater equity for the customers.

1) Track customers, not just meters

Since DPW keeps information on accounts linked to meters, rather than customers, it is often difficult to determine the true impact of DPW's processes in terms of efficiency and equity. For instance, anecdotal evidence suggests that due to socio-economic conditions of particular neighborhoods, Baltimore faces instances where multiple families or large extended families live under one roof, and other instances where houses are completely

vacant. Improving account classification and tracking customers linked to accounts might provide strategic information for DPW and the City, and offer an understanding of how people are impacted by increasing financial burden.

In terms of classification, DPW classifies its accounts based on meter sizes. As earlier data revealed, this leads to confusion when a large meter is designated "commercial" due to its size, even if it serves multiple residential units. It is possible that DPW uses a different classification system internally, and chose not to share that information in response to the public information request. If that is the case, the utility should reconsider sharing information, and improve transparency, such that advocates, officials, and utility members can deliberate over equity concerns.

If DPW does not already practice this form of record keeping, it should consider reclassifying accounts such that they fall into categories like "residential," "multifamily" and "commercial." Even commercial accounts could be broken down by industry use, so that large steel manufacturers and higher educational institutions are not lumped together with small businesses. For DPW, this level of classification can offer better insight into which type of accounts produce the most challenges, so the utility can tailor responses accordingly.

In addition to reclassifying accounts, DPW should tracking residential customers to understand what happens after a shut off or tax sale. Based on information that was presented at the City Council hearing, possible outcomes include:

- Eviction of tenants.
- Displacement of owners, and subsequent increase in vacancies.
- Residents living off the grid, using food stamps to buy drinking water and visiting community centers or gyms to shower and use the toilet.

These outcomes have significant implications for both equity and efficiency. In terms of efficiency, if people are continuing to make do without water from the utility, then the utility is simply continuing to lose its customer base. If people are vacating houses that are not being re-populated, then again, the utility is losing its customer base, and in the case of vacancy, probably accumulating debt on individual accounts. In terms of equity, it should go without saying that all of the above outcomes impede citizens access to healthy living and economic opportunities.

Tracking customers can be a difficult operational task, and therefore DPW should consider partnering with community organizations to collect this information and review their processes.

2) <u>Conduct robust internal and external audits of collections processes</u>

DPW's collection processes have generated the most public concern, due to the severity of the consequences for customers who might be unable to pay. However, it is difficult to deliberate over equity concerns because there is lack of information on who is being

impacted and why. Given DPW's response to public information requests, it is likely that the utility does not maintain information or records that could lead to a deliberative consensus on collections practices. To improve inefficiencies, and demonstrate greater accountability, the utility should maintain and share records that answer following:

- How much debt is an account in at the point when it is shut off or sent for tax sale?
- How many customers pay after receiving disconnection or tax sale notices?
- How many customers pay after being disconnected or having a tax certificate sold in a tax sale?
- How much does a customer repay, once a collection process has begun (if it is not repaid in full)
- How much time does it take for a customer to repay after a collection process has begun?
- Is the customer enrolled in an assistance program, at the time of notification, after notification, or not at all?

Since tax sales are administered by other agencies, DPW would have to improve coordination across City departments, which is explained in further detail within the next recommendation.

This data would not only reveal the impact of collections processes on customers, but would also help DPW understand the efficiency of their processes, where the most efficient

outcome is 100% recovery of unpaid revenue. Efficiency would also take into account net revenue recovery after subtracting associated administrative costs.

To promote transparency and accountability, DPW's collection processes should also be audited by an external party. An external audit would uncover any perverse operational or profit incentives for the utility that disproportionately impact customers. Although the City Comptroller conducts occasional audits of the agency, the frequency of these audits should be increased such that they occur every year, and the audits should include a focus on customer impacts, not just financial conditions of the agency. Audits that include revenue recovery rates, administrative costs of collection, and customer impacts (such as number of shut offs and tax sales) would allow deliberation with advocates who propose alternative rate structures and collections processes. If the Comptroller's office does not have the capacity to conduct such audits, an external organization should be contracted by the City to ensure citizen's concerns are addressed.

3) Increase cooperation across City agencies and peer utilities

Not only is it in the utility's interest to understand where revenue is being lost or gained by maintaining better records on collections practices, it is also in the City government's interest to understand where the utility is losing or gaining revenue in relation to other agencies, like the Department of Housing. If shut offs cause or increase vacancies, it adds to the burden of the City, and could have net negative consequences for the City's broader economic development goals. Although vacancy data could be shared after it is collected,

ideally, if departments maintained similar database systems, it would require less administrative work for a representative in one department to download and share data with the representative of another department. Similar to how Baltimore's "Open Budget" maintains data on the operating budgets of all city departments using the Socrata platform, other platforms could be considered to share non-financial data internally, between city agencies. The Department of Planning could also stand to gain efficiencies if it had access to parcel level information about vacancies and affordable housing developments, all of which have demonstrated some connection with challenges in water and sewer provision.

Similarly, increasing cooperation with peer utilities could also serve the interest of both the DPW and the public. Benchmarking within the utility industry is an important process for any individual utility to quickly understand where they stand and what challenges they might need to address. Sharing data for the sake of benchmarking has led to popular industry reports like the American Water Works Association (AWWA) rate survey which collects information on water and wastewater rates and charges across the United States every two years. In 2016, out of 1000 utilities that were asked to participate, around 200 responded. Baltimore is not on the list, and neither is WSSC, so the only representatives from Maryland are two small-to-mid size utilities. It is understandable that surveys like these often take a significant amount of administrative time to complete, but they also provide benefits to the participants and the rest of the industry at large.

In addition to sharing financial and other quantitative data, utilities would also benefit from using industry organizations as a platform to share challenging experiences.

According to a journal article in the March 2017 edition of the AWWA journal: "It would improve the industry if the perspectives of operators were more widely disseminated and not lost in daily operator logs and quarterly reports…" (Mercer 2017).

Sharing non-quantitative data has implications for the spread of policies within the industry, such that technical experts can begin to account for explanatory factors such as regulatory structures, governance institutions, and political environments, before adopting strategies to improve a utility's performance and reputation.

4) Be proactive with customer outreach, not reactive with shutoffs

Discourse from public hearings and presentations suggest that DPW thinks it is offering enough assistance to customers who cannot afford the burden of increasing water and wastewater rates. However, low enrollment numbers, and citizen testimony, prove that citizens are more aware about DPW's punitive collections processes, rather than their assistance programs. DPW has admitted to issues with outreach, and called for residents to reach out to the utility as soon as they are facing financial difficulties, to reduce the likelihood of shut offs and tax sales. However, to address equity concerns, DPW could prioritize customer outreach over collections processes by improving the way in which it reaches out to customers in a targeted and efficient manner. Identifying potentials to improve enrollment in customer assistance programs does not disregard calls for changes in the rate structure to address long-term affordability issues, but recognizes that the

utility could exploit tools that are readily available, improving both efficiency and equity concerns in the short-term.

Targeted outreach begins with better goal-setting. Based on information shared with the public at the City Council hearing, DPW only records the number of participants that are enrolled in assistance programs, which does not directly translate to a measurement of the effectiveness of the program. To understand whether customer assistance programs are effective, and to improve effectiveness, DPW should conduct annual analyses on the number of customers that are eligible for their respective programs, and set target goals for enrollment based on these numbers (e.g. 50% of eligible customers have been enrolled in the senior citizen discount program). If the analysis predicts where eligible populations are located, DPW can conduct quarterly clinics at community centers or churches to enroll eligible participants in those neighborhoods. Examples of analysis that could lead to proactive enrollment clinics include:

- Analyzing census data at the tract or block level to understand where populations under a certain income level are located.
- Analyzing billing records to identify neighborhoods where the majority of accounts have accumulated debt, submitted late payments, or received notifications for disconnections.

A number of other researchers and consultants, including Roger Colton and Joan Jacobson have also suggested that the utility could improve the effectiveness of assistance programs

for low-income residents by simply linking the water agency's programs to other similar utility programs (Colton 2017; Jacobson 2016). According to Jacobson, the Maryland Department of Human Resources approved 25,000 city households for energy assistance in FY2016, much larger than the number of people currently enrolled in DPW's programs which tend to be below 5000 (Jacobson 2016). Linking these two programs such that people that are already enrolled in one become automatically enrolled in the other is an easy solution for both customers and the utility because it increases outreach with minimal input on the part of the utility.

5) Incorporate citizens into planning processes

Literature on transparency and accountability reforms suggests that availability of information is only effective when there are opportunities to engage with that information. Based on that recognition, it is important for DPW to incorporate citizens into its planning processes such that citizens have an opportunity to provide feedback or negotiate outcomes based on the information they are provided. If citizens are incorporated into planning processes, the utility can design programs that better reflect the needs of customers, while meeting their own needs. If customer's interests are met, or agreed upon through a deliberative process, customers are more likely to follow through on payments, improving the utility's revenue recovery as well.

Based on an interview with Councilman Henry, implementation of the Baltimeter program exposed poor customer experiences that could have been avoided with better customer

feedback. After the new metering system was installed, many customers found water consumption difficult to interpret:

"If you start on January 1 with a water meter reading of 0 and you use 1200 units of water in January, they will bill you for a 1000 units, because they bill you for whatever 1000th unit you just crossed. If in February you use 1900 units, now your meter will be at 3100, so they'll bill you for 2000 units because you went from the 1000, past the 2000, past the 3000 mark on virtual water usage. And that is how they measure. And that is possibly the least intuitive way to do it" (Henry 2018).

In the case of Baltimeter, Councilman Henry acknowledged that DPW might have simply bought a package from an external contractor and then failed to customize it, but difficulty in interpreting bills impacts the faith that people have in the accuracy of the bill, and contributes to a customer's decision about whether or not to pay. It is unclear if customers had any say in the type of metering system that was chosen for the Baltimeter program, but, collecting and incorporating user feedback for system upgrades that citizens will have to interface with, avoids situations like these, and ensure customers that their ease of interpretation is just as important as the Department's ease of use.

The Integrated Planning Framework (IPF), which was discussed in detail in chapter III, is another opportunity to improve avenues for customer engagement. Although the IPF places "stakeholder engagement" as step 8 of the 12-step process, involving citizens in the earlier stages will prove more fruitful. Allowing citizens to see the number of projects that

have to be completed, and the methods used to prioritize citizens, will reduce negative perceptions amongst citizens that DPW is setting an agenda to fulfill its own interests. Furthermore, allowing citizens to have a say in the methodology used to analyze affordability of different capital planning scenarios would significantly improve relations as well. Citizens can help determine thresholds for affordability, or provide reasons for why the thresholds need to be higher. DPW can respond to affordability concerns by sharing what other utilities are doing, and explain how increasing thresholds would result in costs beyond the utility's financial capacity.

The IPF process could also allow for discussion about state and federal contributions, which customers are currently removed from. Existing financial reporting mechanisms, including DPW's Annual Reports and the City's Comprehensive Annual Financial Reports, present challenges in identifying the levels of financial contribution that DPW receives from federal and state agencies. While this information could be acquired from state or federal level audit reports, the utility might want to consider sharing this information with customers through the capital planning process, so customers understand how much of the burden is being placed on them, and why. It could also provide motivation for citizens to organize and assist efforts aiming to increase federal and state level spending for water and wastewater agencies that are currently limited to professional engineering and industry associations.

In addition to capital planning, rate increase approvals could also be more deliberative if the Board of Estimates composition was altered, such that the Director of Public Works did

not vote on requests that benefitted his or her own organization. The Director could be replaced with a representative from a citizen advisory committee, such as the ones that have been institutionalized by the San Francisco Public Utilities Commission (SF PUC). SF PUC's citizen advisory committees are comprised of 17 members, appointed by the Mayor, and the Board of Supervisors. Candidates have to demonstrate certain qualifications, such as representing a community, business, environmental, or environmental justice organization, or have demonstrated knowledge, skill, or experience in the field of public utilities or environmental science (SF PUC n.d.).

The SF PUC and DC Water cases provide two examples of large utilities that have prioritized or formalized citizen engagement in one form or another. The effectiveness of these engagement strategies needs to be understood in conjunction with resulting financial and material improvements for the utility, as well as the associated costs of engagement. Literature like Fung (2006) suggests critical approaches to analyzing engagement strategies, including participant selection methods, modes of communication and decision, and extent of authority and power granted to citizens, while industry organizations provide information on costs associated with such strategies. For instance, UNC EFC's report from 2017 details a case where the City of Phoenix reported spending over $600,000 in advisor fees "for assistance carrying out highly participatory valuation of [project] delivery options that included technical analysis and preparation of reports" (UNC EFC 2017). While this thesis does not go into an in-depth cost-benefit analysis of participatory mechanisms, it builds a case for prioritizing citizen engagement, given the financial constraints faced by

both the utility and its customers. It also examines DPW's processes to reveal weak links that could be improved through greater participation, transparency, and/or accountability.

Future Research

A number of questions came up during the course of this research that could not be considered at this time but should be pursued to address the long term impacts of rising financial pressures on the water utility, on individuals, and on the city at large.

i) Organizational Structures: Demands for civilian oversight from residents of Baltimore might seem extreme, but they bring up questions of what an ideal organizational structure might look like in terms of improving performance and accountability of the department. An executive level officer at DPW mentioned that one of their challenges is that DPW has to act like a city agency even though, in operation, it behaves like a regional utility. Indeed, two of DPW's neighboring peer utilities operate under a different kind of structure. WSSC is led by a board of six commissioners, with three commissioners from each of two counties that WSSC serves. Commissioners are appointed to two year terms by their respective county executives, and oversee the General Manager, an internal audit director, and a corporate secretary. This provides WSSC with more autonomy than the average city agency, while ensuring oversight from county governments. DC Water also follows a more autonomous structure, since its 1996 transition from a city agency to an independent utility with a board of directors. Given discontent on the side of the customers and the utility in terms

of how DPW is set up, it might be worth undertaking research to see what kind of challenges would be addressed if the utility were to undergo an organizational transition, and whether it would be legally and economically feasible to do so.

ii) Living Costs: While DPW has provided a breakdown of water and wastewater bills in the county and the city to address concerns that city customers are billed more, the department has not been able to address the concern that overall living costs in Baltimore city are higher than surrounding counties and regions. Researching water and sewer charges as part of a larger bundle of charges could help refute this perception or validate it. If validated, policy-makers need to consider how to balance affordability of water with other basic services like energy, transportation, and housing. In contexts like Baltimore where median household incomes are very low, a harsh consequence for nonpayment of water bills could result in people choosing to prioritize water bills over other bills. Meaning that even if water bills are being paid, the burden might simply get shifted to other areas where the customer is still facing harm. Evidence from advocates also suggests that low-income residents in Baltimore are resorting to using food stamps to buy water. It is unclear if anyone is tracking this, or looking at the subsequent health impacts of a customer who is choosing to prioritize water over food.

An initiative like the living wage calculator which collects information on local cost of living, is a potential template for researchers who want to understand

and compare the cost of living within neighborhoods of Baltimore City, as well as adjacent neighborhoods of Baltimore County. This has potential implications for redistributing benefits between the County and the City.

iii) Affordable Housing Production and Preservation: Comments from housing advocates and developers during the public hearings demonstrates how water rates impact existing incentive structures for affordable housing developers. Developers often receive subsidies from HUD in the form of utility allowances that reduce their operational costs, increase their margins, and provide an incentive for them to build more affordable units. However, if HUD allowances do not increase in proportion to water rate increases, as developers are claiming, this incentive decreases and developers either build fewer units, or pass on the costs to customers. If water rates continue to rise significantly as they have since 2002, researchers might want to look into subsequent impacts on the stock of affordable housing in Baltimore.

iv) Own source revenue: One of the most publicly controversial topics in the past few years has been DPW's practice of sending homes to tax sale to collect on unpaid water bills. After movement from advocates and state legislators, a bill in the Maryland Senate passed, placing a two-year moratorium on tax sales for unpaid water bills only, effective in October 2018. There are a few caveats to this bill, including the fact that homes can go to tax sale if they have unpaid water bills in addition to other unpaid bills like property taxes. The bill does not

address other concerns with the practice of the tax sale system in general which has come under scrutiny, and in October 2016, the Center for Community Progress sponsored an assessment of the City's tax sale system which found that the tax sale system in Baltimore was not entirely efficient, effective, or equitable. As the state bill goes into effect, tax sales should be closely monitored to understand how the exclusion of unpaid water bills impacts DPW's finances, as well as the city's overall finances, to catch perverse incentives, and build a case for more equitable forms of revenue for a cash strapped city.

The above recommendations are just a subset of policies and research projects that could carry the findings from this thesis forward. The hope remains that at minimum, future research or work should take into account lived experiences of citizens as much as the expertise of individuals. In the course of this research, lived experience brought to light the interconnectivity between systems that traditionally operate in silos, and the inequities that are amplified as a result.

Conclusion

In August 2016, while citizens of Baltimore were exclaiming discontent with their utility at a public hearing hosted by the Baltimore City Council, DPW's Director Rudolph S. Chow was receiving the "Utility of the Future Today" award by the Utility of the Future Recognition Program, which celebrates the progress and exceptional performance of the nation's best-run wastewater utilities. Soon after in 2017, he was receiving the American Society of Civil Engineers "Engineer of the Year" award, as a result of his commitment to the health, environment, and economy of Baltimore (ASCE 2017).

Much as the spectacle of violence is the only side of Baltimore viewed by citizens across the country, the spectacle of success seems to be the only side of Baltimore viewed by the nation's engineers.

While this contrast might be surprising for outsiders, Baltimore has never been a stranger to dichotomies. According to Matthew Crenson, a historian and political scientist at Johns Hopkins University who has spent years compiling a complete political history of Baltimore, there is one way to explain conflicting views of the city:

"Perhaps it is possible to be Mob town and Charm City at the same time" (Crenson 2017).

It is with this understanding that the nature of this research has evolved. What began as an attempt to understand how to improve DPW's financial conditions, soon evolved into a question about perception and trust.

Rather than contributing to support for, or accusations against the utility, this research has asked a much different question: Given the increasing financial pressure on both utilities and residents, is it possible to transform processes, such that perceptions of residents are no longer at odds with the perceptions of engineers? Is it possible, therefore, to further the interests of both at the same time?

While utilities favor quantitative metrics of success over and above the perception of customers, paying attention to the latter has already proven crucial to some, and holds promise for cities like Baltimore, where a historically disenfranchised population continues to face struggles every day.

As discourse on water infrastructure finance continues to grow, my hope as an engineer remains that other engineers who often tout their civic responsibility to the greater public, can also begin to reflect on the power that precedes that responsibility, and the way that power manifests itself within a system of technical expertise, political maneuverings, and social inequities.

Bibliography

Ahlers, Rhodante, and Vincent Merme. 2016. "Financialization, Water Governance, and Uneven Development." *WIRES Water* 3 (6): 766–744.

ASCE. 2017. "Rudolph S. Chow, PE - Civil Engineer of the Year, 2017 - ASCE Maryland Section." 2017. http://www.ascemd.org/awards/chow.

"Audit Reports." 2015. Baltimore City Comptroller. September 16, 2015. https://comptroller.baltimorecity.gov/audits/reports.

"Audit_WaterFund_2013-2014." n.d. Accessed March 28, 2018. https://comptroller.baltimorecity.gov/sites/default/files/Water%20Utility%20Fund.pdf.

AWWA, and Raftelis. 2017. *2016 Water and Wastewater Rate Survey*.

Bakker, Karen, Michelle Kooy, Nur Endah Shofiani, and Ernst-Jan Martijn. 2008. "Governance Failure: Rethinking the Institutional Dimensions of Urban Water Supply to Poor Households." *World Development*, Special Section (pp. 2045-2102). The Volatility of Overseas Aid, 36 (10): 1891–1915. https://doi.org/10.1016/j.worlddev.2007.09.015.

"Baltimore City Archives (Department of Public Works) 1794-1977 BRG47." n.d. Maryland State Archives Guide to Government Records. Accessed May 16, 2018. http://guide.msa.maryland.gov/pages/series.aspx?ID=brg47.

"Baltimore City Code Article 24." n.d. City of Baltimore. Accessed March 27, 2018. http://ca.baltimorecity.gov/codes/Art%2024%20-%20Water.pdf.

Bel, Germa, and Mildred Warner. 2008. *Does Privatization of Solid Waste and Water Services Reduce Costs? A Review of Empirical Studies*. Vol. 52. https://doi.org/10.1016/j.resconrec.2008.07.014.

BidBaltimore. n.d. "Baltimore Tax Sale Results." Baltimore Tax Certificate Auction Website. https://www.bidbaltimore.com/main.

"BidBaltimore: Auction Schedule." n.d. Baltimore Tax Certification Auction Website. Accessed May 19, 2018. https://www.bidbaltimore.com/main?unique_id=D0F06D025B8911E8B6A9DFD54C4CB1D0&filename=auction_schedule.html&use_this=serve_document.

Bloomberg Cities. 2018. "How DC Water's George Hawkins Made Sewage Sexy." *Bloomberg Cities* (blog). March 8, 2018. https://medium.com/@BloombergCities/how-dc-waters-george-hawkins-made-sewage-sexy-4435829e7d7c.

"Board of Estimates." 2015. Baltimore City Comptroller. September 14, 2015. https://comptroller.baltimorecity.gov/boe.

BOE. 2010. *Proposed Water and Sewer Rate Increases and Miscellaneous Fee Increases*. City of Baltimore: Baltimore City Comptroller. https://comptroller.baltimorecity.gov/sites/default/files/3284-3536_2016-08-31.pdf.

———. 2013. *Proposed Water and Sewer Rate Increases and Miscellaneous Fee Increases*. City of Baltimore: Baltimore City Comptroller. https://comptroller.baltimorecity.gov/sites/default/files/3284-3536_2016-08-31.pdf.

———. 2016. *Proposed Water and Sewer Rate Increases and Miscellaneous Fee Increases*. City of Baltimore: Baltimore City Comptroller. https://comptroller.baltimorecity.gov/sites/default/files/3284-3536_2016-08-31.pdf.

Boone, Christopher G. 2003. "Obstacles to Infrastructure Provision: The Struggle to Build Comprehensive Sewer Works in Baltimore." *Historical Geography* 31 (0): 151–68.

Boyle, Kathleen [ICG-RSCH]. 2018. "THE PUBLIC WEALTH OF CITIES: How to Turn Around Cities Fortunes by Unlocking Public Assets." *Citi GPS: Global Perspectives & Solutions*, March, 68.

Broadwater, Luke. 2012. "'WaterBillWoman' Pestered City for Years over Faulty Bills." *The Baltimore Sun*, March 6, 2012. http://www.baltimoresun.com/news/maryland/bs-md-ci-water-bills-20120224-story.html.

———. 2015a. "Baltimore to Send Water Turn-off Notices to 25,000 Delinquent Customers." *The Baltimore Sun*, March 26, 2015. http://www.baltimoresun.com/news/maryland/baltimore-city/bs-md-ci-water-bills-20150326-story.html.

———. 2015b. "Protesters Call on Mayor to Stop Water Shut-Offs over Unpaid Bills." *The Baltimore Sun*, April 16, 2015. http://www.baltimoresun.com/news/maryland/politics/bs-md-ci-water-shutoffs-20150416-story.html.

———. 2015c. "City Shuts off Water to Delinquent Residents; Hits Baltimore Co. Homes Hardest." *The Baltimore Sun*, May 15,

2015. http://www.baltimoresun.com/news/maryland/baltimore-city/bs-md-ci-water-shutoffs-20150515-story.html.

———. 2015d. “Baltimore Eviction Rate amongst Highest in Country, Study Says.” *The Baltimore Sun*, December 7, 2015.

———. 2016a. “Audits Are Primary Issue in Baltimore Comptroller’s Race.” *The Baltimore Sun*, February 20, 2016. http://www.baltimoresun.com/news/maryland/politics/bs-md-ci-comptroller-race-20160220-story.html.

———. 2016b. “Baltimore Contract for New Water-Billing System Grows by $6 Million.” *The Baltimore Sun*, October 5, 2016. http://www.baltimoresun.com/news/maryland/baltimore-city/bs-md-ci-water-billing-20161004-story.html.

———. 2017. “French Company Pitches to Take Control of Baltimore’s Water System, Lobbyists Join Push.” *The Baltimore Sun*, December 19, 2017. http://www.baltimoresun.com/news/maryland/baltimore-city/bs-md-ci-water-privatization-20171219-story.html.

———. 2018. “When the Water Bill Is $50,000: Hundreds of Baltimore Customers Hit with Incorrect Bills.” *The Baltimore Sun*, February 8, 2018. http://www.baltimoresun.com/news/maryland/baltimore-city/bs-md-ci-water-bill-errors-20180208-story.html.

Butler, Lindsey J., Madeleine K. Scammell, and Eugene B. Benson. 2016. “The Flint, Michigan, Water Crisis: A Case Study in Regulatory Failure and Environmental Injustice.” *Environmental Justice* 9 (4): 93–97. https://doi.org/10.1089/env.2016.0014.

"CAFR." 2000. Comprehensive Annual Financial Report. City of Baltimore.

———. "CAFR." 2007. Comprehensive Annual Financial Report. City of Baltimore.

———. "CAFR." 2012. Comprehensive Annual Financial Report. City of Baltimore.

———. "CAFR." 2013. Comprehensive Annual Financial Report. City of Baltimore.

———. "CAFR." 2014. Comprehensive Annual Financial Report. City of Baltimore.

———. "CAFR." 2015. Comprehensive Annual Financial Report. City of Baltimore.

———. "CAFR." 2016. Comprehensive Annual Financial Report. City of Baltimore.

———. "CAFR." 2017. Comprehensive Annual Financial Report. City of Baltimore.

Campbell, Colin. 2016. "2 Street Collapses above 100-Year-Old Baltimore Sewer Line Expected to Cost $10 Million or More." *The Baltimore Sun*, September 7, 2016. http://www.baltimoresun.com/news/maryland/baltimore-city/bs-md-ci-street-repairs-20160906-story.html.

CBO. 2015. "Public Spending on Transportation and Water Infrastructure, 1956 to 2014." Congressional Budget Office. https://www.cbo.gov/publication/49910.

Chow, Rudy. 2015. "Keeping the Water Billing System Fair in Baltimore." *The Baltimore Sun*, November 6, 2015. http://www.baltimoresun.com/news/opinion/oped/bs-ed-water-bills-20151107-story.html.

———. 2017. "Join Us in DC for the Water Fly-In." *WEF WaterBlog* (blog). 2017. https://www.wef.org/wef-waterblog/join-us-in-dc-for-the-water-fly-in/.

Chow, Rudy, Sean Searles, Lynette Cardoch, and Jane McLamarrah. 2013. "Integrated Infrastructure Planning: A Case Study of Baltimore's Integrated Planning Framework." In . Chicago. http://www3.apwa.net/library/meetings/congress/8187.pdf.

City Council. 2016. *Informational Hearing on Water Affordability*. https://www.youtube.com/watch?v=_x4O0emN7ZE.

Cohen, Zeke. 2018. Baltimore City Councilman, District 1 Interview by Haleemah Qureshi.

Colton, Roger. 2017. "Baltimore's Conundrum: Charging for Water/Wastewater Servives That Community Residents Cannot Afford to Pay." Prepared for Food and Water Watch. https://www.foodandwaterwatch.org/sites/default/files/baltimore_water_study-final_report-2017.pdf.

Copeland, Claudia. 2012. "Water Infrastructure Financing: History of EPA Appropriations." Congressional Research Service. https://fas.org/sgp/crs/misc/96-647.pdf.

Cornish, Stephanie. 2014. "Advocates Say Efficiency Is Equal to Water Privatization." *Afro* (blog). December 3, 2014. https://www.afro.com/advocates-say-efficiency-is-equal-to-water-privatization/.

Cotruvo, Joseph A. n.d. "Safe Drinking Water Act Amendments of 1986," 4.

Craley, Rocky, and Catherine Noyes. 2013. "Water and Wastewater Rates on the Rise." *AWWA Journal* 105 (8): 41–44.

Crenson, Matthew A. 2017. *Baltimore: A Political History*. JHU Press.

"Cutting the Tax Rate." 2016. The Maryland Public Policy Institute. April 25, 2016. http://www.mdpolicy.org/research/page/cutting-the-tax-rate.

Cwiek, Sarah. n.d. "Citizen Research Links Detroit Water Shutoffs, Tax Foreclosures." Michigan Radio. Accessed May 16, 2018. http://michiganradio.org/post/citizen-research-links-detroit-water-shutoffs-tax-foreclosures.

Dale, Daniel. 2015. "Baltimore, Detroit Threaten Thousands with Water Shut-off | The Star." *The Star*, April 22,

2015. https://www.thestar.com/news/world/2015/04/22/baltimore-detroit-threaten-thousands-with-water-shut-off.html.

"Data & Demographics." 2016. City of Baltimore Department of Planning. January 7, 2016. https://planning.baltimorecity.gov/planning-data.

DC Water. 2013. "Blue Horizon 2020; DC Water Strategic Plan." https://www.dcwater.com/strategic-plan.

———. 2015. "Blue Horizon 2020; Revised DC Water Strategic Plan Framework." https://www.dcwater.com/strategic-plan.

———. 2018a. "Retail Water and Sewer Rates Committee Meeting (Jan)." https://www.dcwater.com/sites/default/files/1-23-2018%20Retail%20Water%20and%20Sewer%20Rates%20Committee%20Package.pdf.

———. 2018b. "Retail Water and Sewer Rates Committee Meeting (Feb)." https://www.dcwater.com/sites/default/files/1-23-2018%20Retail%20Water%20and%20Sewer%20Rates%20Committee%20Package.pdf.

———. 2018c. "Retail Water and Sewer Rates Committee Meeting (March)." https://www.dcwater.com/content/dc-retail-water-sewer-rates-committee-agenda-march-27-2018.

Department of Planning. 2017. "FY18-23 Six Year Capital Improvement Program." City of Baltimore. http://planning.baltimorecity.gov/sites/default/files/FY18-23%20Project%20Fund%20Summary%20by%20Fiscal%20Year%20-%20Ordinance%20of%20Estimates.pdf.

DPW. 2015a. “Annual Report for the Department of Public Works FY 2014.”

———. 2015b. “Guidelines for Delinquent Account Turn-Off (CSSD-Turn-Off 1.1).”

———. 2015c. “City v County Billing Methods and Rates.” Baltimore City Department of Public Works. December 28, 2015. https://publicworks.baltimorecity.gov/pw-bureaus/water-wastewater/services/methods.

———. 2015d. “Wastewater Operations.” Baltimore City Department of Public Works. December 28, 2015. https://publicworks.baltimorecity.gov/pw-bureaus/water-wastewater/wastewater.

———. 2015e. “Water Distribution.” Baltimore City Department of Public Works. December 28, 2015. https://publicworks.baltimorecity.gov/pw-bureaus/water-wastewater/water/operations/distribution.

———. 2015f. “Water Quality Operations.” Baltimore City Department of Public Works. December 28, 2015. https://publicworks.baltimorecity.gov/pw-bureaus/water-wastewater/water/operations.

———. 2016a. “Annual Report for the Department of Public Works FY 2015.”

———. 2016b. “An Overview of Baltimore City’s Modified Consent Decree.” presented at the Joint Public Information Session, June 7. http://publicworks.baltimorecity.gov/sites/default/files/06072016%20CD%20presentation_powerpoint.pdf.

———. 2016c. “Water Main Breaks Dramatically Decline.” Baltimore City Department of Public Works. July 7, 2016. https://publicworks.baltimorecity.gov/news/press-releases/2016-07-07-water-main-breaks-dramatically-decline.

———. 2016d. “BaltiMeter Billing Switches On.” Baltimore City Department of Public Works. *Press Release* (blog). October 11, 2016. https://publicworks.baltimorecity.gov/news/press-releases/2016-10-11-baltimeter-billing-switches.

———. 2017a. “Annual Report for the Department of Public Works FY 2016.”

———. 2017b. “Baltimore City Sanitary Sewer Consent Decree Program.” Baltimore City Department of Public Works. November 2, 2017. https://publicworks.baltimorecity.gov/sewer-consent-decree/sanitary-sewer-consent-decree-program.

———. 2018a. “Annual Report for the Department of Public Works FY 2017.”

———. 2018b. “Public Information Act Response.”

———. n.d. “Customer Support Services - Negotiation Assistance.” http://162.242.255.103/resource/baltimore-city-department-of-public-works-bureau-of-water-and-wastewater/.

Eckell, Rianna, Komal Vaidya, and Amy Heddon. 2018. Baltimore Right to Water Coalition Interview by Haleemah Qureshi.

Edwards, Marc, Simoni Triantafyllidou, and Dana Best. 2009. “Elevated Blood Lead in Young Children Due to Lead-Contaminated Drinking Water: Washington, DC, 2001–2004.” *Environmental Science & Technology* 43 (5): 1618–23. https://doi.org/10.1021/es802789w.

Eggers, William, and Tiffany Dovey. n.d. “Closing America’s Infrastructure Gap: The Role of Public-Private Partnerships.” Deloitte Research. Accessed May 14, 2018. https://www.cdfifund.gov/Documents/Public-Private_Partnerships.pdf.

Ericson, Edward. 2014. “DPW Rushes into the Modern Age of Service Delivery--with QR Codes?” *Baltimore City Paper*, November 11, 2014. http://www.citypaper.com/news/mobtownbeat/bcp-dpw-rushes-into-the-modern-age-of-service-deliverywith-qr-codes-20141111-story.html.

Espinola, Ann. 2017. “Water Rates Revealed for Small, Medium, Large Utilities.” *AWWA Connections*, March 27, 2017. https://www.awwa.org/publications/connections/connections-story/articleid/4575/water-rates-revealed-for-small-medium-large-utilities.aspx.

Farr, Andrew. 2017. “The Revelations of George Hawkins.” *Water Finance & Management* (blog). December 18, 2017. https://waterfm.com/revelations-george-hawkins/.

Fenston, Jacob. 2017. “Outgoing DC Water CEO Raised Agency’s Profile, But Faces Criticism Over Fee Increases.” *WAMU*, December 12, 2017. https://wamu.org/story/17/12/12/outgoing-dc-water-ceo-raised-agencys-profile-struggled-justify-price-increases/.

Fung, Archon. 2006. “Varieties of Participation in Complex Governance.” *Public Administration Review* 66: 66–75.

Fung, Archon, Mary Graham, and David Weil. 2007. *Full Disclosure: The Perils and Promise of Transparency*. Cambridge University Press.

Fung, Archon, and Erik Olin Wright. 2001. “Deepening Democracy: Innovations in Empowered Participatory Governance.” *Politics & Society* 29 (1): 5–41. https://doi.org/10.1177/0032329201029001002.

Graham, Stephen, and Simon Marvin. 2001. *Splintering Urbanism: Networked Infrastructures, Technological Mobilities and the Urban Condition*. London: Routledge.

Graziani, Kim, and Frank Alexander. 2016. "Assessment of Baltimore City's Tax Sale System: Impacts on City Finances, Vacant Properties, and Vulnerable Owner Occupants." TASP Final Report. Center for Community Progress.

Grove, Kimberly. 2018. Chief, Office of Compliance, Department of Public Works Interview by Haleemah Qureshi.

Hackman, Rose. 2014. "What Happens When Detroit Shuts Off the Water of 100,000 People - The Atlantic." *The Atlantic*, July 17, 2014. https://www.theatlantic.com/business/archive/2014/07/what-happens-when-detroit-shuts-off-the-water-of-100000-people/374548/.

Henn, Margaret. 2018. Project Manager, Baltimore Pro Bono Legal Center Interview by Haleemah Qureshi.

Henry, Bill. 2018. Baltimore City Coucilman, District 4 Interview by Haleemah Qureshi.

"Historic Dates." 2015. Baltimore City Department of Public Works. December 28, 2015. https://publicworks.baltimorecity.gov/pw-bureaus/water-wastewater/water/history/dates.

Holmes, Tommy. 2017. "Infrastructure Financing - AWWA Cheers Boost in WIFIA Funding." American Water Works Association. 2017. https://www.awwa.org/legislation-regulation/issues/infrastructure-financing.aspx.

"How to Dispute a Water Bill?" 2017. *Reddit*. https://www.reddit.com/r/baltimore/comments/5bme8n/how_to_dispute_a_water_bill/#bottom-comments.

Inhofe, James. 2016. *The Federal Role in Keeping Water and Wastewater Infrastructure Affordable*. https://www.epw.senate.gov/public/index.cfm/2016/4/the-federal-role-in-keeping-water-and-wastewater-infrastructure-affordable.

Jacobson, Joan. 2016. "Keeping the Water On: Strategies for Addressing High Increases in Water and Sewer Rates for Baltimore's Most Vulnerable Customers." *Abell Foundation* 29 (4): 28.

Johnson, Mirmiran & Thompson, Inc. 2018. "Independent Engineering Inspection of the DC Water Wastewater and Water Systems."

Khagram, Sanjeev, Archon Fung, and Paolo de Renzio, eds. 2013. "Overview and Synthesis: The Political Economy of Fiscal Transparency, Participation, and Accountability Around the World." In *Open Budgets: The Political Economy of Transparency, Participation, and Accountability*. Brookings Institution Press. http://www.jstor.org/stable/10.7864/j.ctt1262zx.

Kosack, Stephen, and Archon Fung. 2014. "Does Transparency Improve Governance?" *Annual Review of Political Science* 17 (1): 65–87. https://doi.org/10.1146/annurev-polisci-032210-144356.

Lamb, Charles M. 2005. *Housing Segregation in Suburban America since 1960: Presidential and Judicial Politics*. Cambridge University Press.

Lazarick, Len. 2015. "What to Do about Baltimore's High Taxes." *Maryland Reporter* (blog). October 6, 2015. http://marylandreporter.com/2015/10/06/what-to-do-about-baltimores-high-taxes/.

Levine, Marc V. 2000. "Third-World City in the First World: Social Exclusion, Racial Inequality, and Sustainable Development in Baltimore, Maryland." In *The Social*

Sustainability of Cities: Diversity and the Management of Change. Toronto: University of Toronto Press.

———. 2015. "The Failure of Economic Development in Baltimore - and Milwaukee." *Milawukee Journal Sentinel*, May 22, 2015. http://www.jsonline.com/news/opinion/the-failure-of-economic-development-in-baltimore--and-milwaukee-b99504153z1-304738911.html.

Mack, Elizabeth A., and Sarah Wrase. 2017. "A Burgeoning Crisis? A Nationwide Assessment of the Geography of Water Affordability in the United States." *PLoS ONE* 12 (1). https://doi.org/10.1371/journal.pone.0169488.

Mansbridge, Jane, James Bohman, Simone Chambers, David Estlund, Andreas Føllesdal, Archon Fung, Cristina Lafont, Bernard Manin, and José luis Martí. 2010. "The Place of Self-Interest and the Role of Power in Deliberative Democracy*." *Journal of Political Philosophy* 18 (1): 64–100. https://doi.org/10.1111/j.1467-9760.2009.00344.x.

"Maryland Board of Public Works." n.d. Maryland Manual On-Line - A Guide to Maryland & It's Government. Accessed May 17, 2018. https://msa.maryland.gov/msa/mdmanual/08conoff/html/05bpw.html.

Mayor Rawlings-Blake. 2013. "Change to Grow - A Ten-Year Financial Plan for Baltimore FY2013-FY2022." City of Baltimore. https://bbmr.baltimorecity.gov/sites/default/files/BBMR_ChangeToGrow.pdf.

McClintock, David. 2012. "Synopsis of OIG Final Report #2011-123: Overbilling of Department of Public Works by Engineering Contractor." Baltimore CIty Office of the Inspector General.

McKinney, Jesse. 2018. “Board of Public Works Approves Funding for Clean Water and the Chesapeake Bay.” Department of The Environment. February 7, 2018. http://news.maryland.gov/mde/2018/02/07/board-of-public-works-approves-funding-for-clean-water-and-the-chesapeake-bay-40/.

MDE. 2015. “Water Audits and Loss Reduction Report.” Maryland Department of the Environment.

———. n.d. “Water Quality Financing Administration.” Department of The Environment. Accessed May 17, 2018. http://mde.maryland.gov/programs/water/WQFA/Pages/index.aspx.

Melosi, Martin. 2000. *The Sanitary City: Urban Infrastructure in America from Colonial Times to the Present*. Johns Hopkins University Press.

Mercer, Kenneth L. 2017. “On Water & Works: Transparency and Accountability.” *American Water Works Association* 109 (3): 2.

Merle, Renae. 2017. “Goldman Sachs CEO: U.S. ‘Needs to Invest in Infrastructure to Keep up!’ - The Washington Post.” *The Washington Post*, June 6, 2017. https://www.washingtonpost.com/news/wonk/wp/2017/06/06/goldman-sachs-ceo-us-needs-to-invest-in-infrastructure-to-keep-up/?noredirect=on&utm_term=.4d616a2c8250.

MSRB. 2017. “Municipal Securities: Financing the Nation’s Infrastructure.” Municipal Securities Rulemaking Board. http://www.msrb.org/~/media/Files/Resources/MSRB-Infrastructure-Primer.ashx.

Murthy, Sharmila L. 2016. "A New Constitutive Commitment to Water." *Social Justice* 36 (June): 77.

NACWA, and AMWA. 2013. "The Impacts of Altering Tax-Exempt Municipal Bond Financing on Public Drinking Water and Wastewater Systems." White Paper. Association of Metropolitan Water Agencies. https://www.amwa.net/sites/default/files/AMWA-NACWA_MuniBondAnalysis_July13.pdf.

Office of Mayor. 2017. "Baltimore City Open Budget." 2017. http://openbudget.baltimorecity.gov/#!/year/2017/operating/0/department?vis=barChart.

Office of the Director. 2018. "DPW Organization Chart." Department of Public Works. April 9, 2018.

O'Leary, Michael. 2018. Tax Sales Coordinator, Department of Housing and Community Development Interview by Haleemah Qureshi.

One Baltimore United. 2014. "Baltimore Water Privatization: Public Hearing Investigating Veolia and HomeServe Warranty." Washington Peace Center. December 1, 2014. https://www.washingtonpeacecenter.org/node/13578.

"Overview of the Sheriff Sale Process." n.d. Philadelphia Sheriff's Office. Accessed May 16, 2018. http://www.officeofphiladelphiasheriff.com/en/real-estate-general/15.

Pelton, Tom. 2016. "What's Behind Baltimore's Failure to Comply with Federal Sewage Consent Decree?" *The Environment in Focus*. WYPR. http://wypr.org/post/what-s-behind-baltimore-s-failure-comply-federal-sewage-consent-decree.

Peterson, George. 1984. "Financing the Nation's Infrastructure Requirements." In *Perspectives on Urban Infrastructure*. National Academies Press.

Ramseur, Jonathan L. 2017. “EPA Policies Concerning Integrated Planning and Affordability of Water Infrastructure.” Congressional Research Service.

“Rates & Fees Overview.” 2015. Baltimore City Department of Public Works. December 28, 2015. https://publicworks.baltimorecity.gov/pw-bureaus/water-wastewater/services/overview.

Reutter, Mark. 2013. “$27 Million in Sewer Consultant Contracts Pushed through BOE.” *Baltimore Brew*, May 1, 2013. https://baltimorebrew.com/2013/05/01/27-million-in-sewer-consultant-contracts-pushed-through-boe/.

———. 2018. “Baltimore ‘Loses’ One Third of Its Treated Water, Data Show.” *Baltimore Brew*, March 28, 2018. https://www.baltimorebrew.com/2018/03/28/baltimore-loses-a-third-of-its-treated-water-data-show/.

SB and Company, LLC. 2013. “Financial Statements and Supplemental Schedules Together with Report of Independent Public Accounts (FY 2013 and 2012).” Maryland Water Quality Financing Administration.

Scharper, Julie. 2012. “Angry Residents Testify about Water Bill Woes.” *The Baltimore Sun*, March 21, 2012. http://www.baltimoresun.com/news/maryland/baltimore-city/bs-md-ci-water-bill-hearing-20120320-story.html.

Scharper, Julie, and Luke Broadwater. 2012a. “City Issuing $4.2 Million in Refunds for Faulty Water Bills.” *The Baltimore Sun*, February 22, 2012. http://www.baltimoresun.com/news/breaking/bs-md-ci-water-audit-20120222-story.html.

———. 2012b. “A Steady Stream of Water Billing Headaches.” *The Baltimore Sun*, March 17, 2012. http://www.baltimoresun.com/news/maryland/baltimore-city/bs-md-ci-waterbills-follow-20120317-story.html.

Senator Eckardt, and Delegate Walker. 2018. “Report of the Task Force to Study Tax Sales in Maryland.” Maryland General Assembly.

SF PUC. n.d. “San Francisco Public Utilities Commission : Citizens’ Advisory Committee.” Accessed May 22, 2018. https://sfwater.org/index.aspx?page=90.

Shin, Annys. 2011. “DC Water Head Is Working to Make Tap Hip Again.” *The Washington Post*, April 20, 2011. https://www.washingtonpost.com/local/dc-water-head-is-working-to-make-tap-hip-again/2011/04/15/AFcBPlEE_story.html?utm_term=.f7df82438026.

Sloan, Erica. 2017. “As He Prepares to Step Down, George Hawkins Reflects on His Time as DC Water’s Fearless Leader.” *Washingtonian*, September 20, 2017. https://www.washingtonian.com/2017/09/20/as-he-prepares-to-step-down-george-hawkins-reflects-on-his-time-as-dc-waters-fearless-leader/.

Smith, Ben. 2017. “In Baltimore, More Police Spending Has Not Lowered Crime.” *The Market Urbanism Report* (blog). November 25, 2017. https://marketurbanismreport.com/baltimore-police-spending-not-lowered-crime/.

Sweeney, Daniel. 2015. “Some Still Struggle with Wildly Inaccurate Water Bills from City.” *The Baltimore Brew*, July 13, 2015. https://www.baltimorebrew.com/2015/07/13/some-still-struggle-with-wildly-inaccurate-water-bills-from-city/.

"Tax Lien Sale NYC: What Homeowners Need to Know." 2018. *Center for New York City Neighborhoods* (blog). March 20, 2018. https://cnycn.org/nyc-tax-lien-sale/.

The White House. 2018. "Legislative Outline for Rebuilding Infrastructure in America." https://www.whitehouse.gov/wp-content/uploads/2018/02/INFRASTRUCTURE-211.pdf.

Troesken, Werner. 2004. *Water, Race, and Disease*. MIT Press.

UN News. 2014. "In Detroit, City-Backed Water Shut-Offs 'Contrary to Human Rights,' Say UN Experts." October 20, 2014. https://news.un.org/en/story/2014/10/481542-detroit-city-backed-water-shut-offs-contrary-human-rights-say-un-experts.

UNC EFC. 2017. "The Financial Impacts of Alternative Water Project Delivery Models: A Closer Look at Nine Communities." UNC Environmental Finance Center.

US EPA. 2015. "Learn About the WIFIA Program." Overviews and Factsheets. US EPA. September 4, 2015. https://www.epa.gov/wifia/learn-about-wifia-program.

———. n.d. "WIFIA Financing Requests: FY 2017 Selected Projects." United States Environmental Protection Agency. Accessed May 17, 2018. https://www.epa.gov/sites/production/files/2017-07/documents/9_baltimore_wifiaprojectfactsheet.pdf.

Warner, Mildred, and Germa Bel. 2008. "Does Privatization of Solid Waste and Water Services Reduce Costs? A Review of Empirical Studies." *Resources Conservation and Recycling* 52 (12).

"Water Utility Fund." n.d. Accessed March 28, 2018. https://comptroller.baltimorecity.gov/sites/default/files/Water%20Utility%20Fund.pdf.

Wenger, Yvonne. 2017. “Clarke Wants Hearings Restored for Water Bill Disputes.” *The Baltimore Sun*, July 14, 2017. http://www.baltimoresun.com/news/maryland/baltimore-city/bs-md-ci-water-billing-conferences-20170714-story.html.

WWi. 2013. “Mind the Gap: Is WIFIA the Answer for US Water Difficulties?” *Water and Wastewater International*, November 2013. https://www.waterworld.com/articles/wwi/print/volume-28/issue-5/regional-spotlight-us-caribbean/mind-the-gap-is-wifia-the-answer.html.

Yeip, Randy. 2015. “Baltimore’s Demographic Divide.” *WSJ*, May 1, 2015. graphics.wsj.com/baltimore-demographics.

Young, Bernard. 2014. *Revenue Obligations - Wastewater Projects - Maximum Aggregate Principal Amount*. https://baltimore.legistar.com/LegislationDetail.aspx?ID=2178161&GUID=FD418EDF-832A-4706-804C-C77F0FCFEBA6&Options=Advanced&Search=.

Appendix A: DPW Public Information Act Request

To: James Phillips-Farley
200 Holliday Street, Suite 203
Baltimore, MD 21202
(410) 396-3312

From: Ms. Haleemah Qureshi
Masters of City Planning Candidate, 2018
Department of Urban Studies and Planning
Massachusetts Institute of Technology
77 Massachusetts Ave,
Cambridge, MA 02139
hqureshi@mit.edu | 202.213.3623

Date: 01/30/2018

Mr. Farley,

I am part of a team of researchers from MIT who recently received a grant to study the issue of water affordability in three major American cities (Baltimore, Detroit, and Philadelphia). Our aim is to understand the challenges faced by water and wastewater utilities in financing increasing capital costs, while continuing to provide quality and affordable services to all citizens.

In order to conduct this research, we would like to request the records below. Please note that we would ideally like this information for each billing period, or year, since 2012, or as far back as possible.

- Total Number of DPW Customers

- Percentage of accounts delinquent on bills
- Uncollected debt
- Number of accounts eligible for shutoff
- Number of accounts disconnected for nonpayment (by type of account: commercial, residential etc.)
- Number of accounts receiving a final notice of disconnection for nonpayment
- Dollars Billed to customers by DPW

- Dollars Received in Payment for DPW Bills
- Average DPW bill for all residential accounts

- Average debt for all residential accounts in debt
- Average bill for all residential accounts in debt
- Number of homes sold at tax sale with water-only liens

Please let me know if any of these require further clarification.

Thank you,
Haleemah Qureshi

Appendix B: DPW Public Information Act Response

BALTIMORE CITY
DPW
DEPARTMENT OF PUBLIC WORKS
RUDOLPH S. CHOW, P. E.
DIRECTOR

DEPARTMENT OF PUBLIC WORKS
WATER AND WASTEWATER BILLING INFORMATION

1. **Total Numbers of Customers**

2015	2016	2017
426,360	427,072	420,681

2. **Percentage of accounts delinquent on bills**

2015	2016	2017
10%	11%	3%

3. **Uncollected debt**

	# of Accounts	Delinquent Dollar Value
June 2015		
All Accounts	41,253	$ 44,863,055.09
1.5" & Below	40,600	$ 39,736,093.08
June 2016		
All Accounts	48,964	$ 69,596,624.43
1.5" & Below	48,009	$ 50,088,144.38
June 2017		
All Accounts	12,708	$ 43,649,962.92
1.5" & Below	11,377	$ 14,000,800.39

4. **Number of accounts eligible for shutoff**

2015	2016	2017
41,253	48,964	12,708

03/1/2018

5. Number of accounts disconnected for nonpayment (by type of account: commercial, residential etc.)

YEAR	NO OF ACCOUNTS
2012	5,321
2013	10,055
2014	6,938
2015	12,157
2016	1,387
2017	5

Do not have by type.

6. Number of accounts receiving a final notice of disconnection for nonpayment

DPW does not retain responsive data.

7. Dollars Billed to customers by DPW

	2015	2016	2017
Water	$ 176,439,000	$ 160,865,000	$157,760,204
Waste Water	$ 216,428.000	$ 229,300,000	$ 231,030,055
Storm water	$ 25,971,000	$ 27,807.000	$ 29,333,992
TOTAL	**$ 202,626,428**	**$ 390,192,807**	**$ 418,124,251**

2017 (City) Revenue Billed: $ 157,180,881.05

8. Dollars Received in Payment for DPW Bills

2015	2016	2017
$ 341,342,051.71	$ 261,307,141,95	

03/1/2018

9. Average DPW bill for all residential accounts

2012

Meter Size	Average CCF per Month	Total Quarterly Water & Sewer & Charges
5/8"	5	$ 68.77
¾"	6	$ 123.78
1"	7	$ 275.08

2013

Meter Size	Average CCF per Month	Total Quarterly Water & Sewer Charges
5/8"	5	$ 74.96
¾"	6	$ 134.93
1"	7	$ 299.84

2014

Meter Size	Average CCF per Month	Total Quarterly Water & Sewer Charges
5/8"	5	$ 86.21
¾"	6	$ 155.18
1"	7	$ 344.84

2015

Meter Size	Average CCF per Month	Total Quarterly Water & Sewer Charges
5/8"	5	$ 95.70
¾"	6	$ 172.26
1"	7	$ 382.80

2016

Meter Size	Average CCF per Month	Total Quarterly Water & Sewer Charges
5/8"	5	$ 106.24
¾"	6	$ 191.24
1"	7	$ 424.96

03/1/2018

2017

Meter Size	Average CCF per Month	Total Monthly Water & Sewer & Charges
5/8"	5	**$ 60.49**
¾"	6	**$ 81.56**
1"	7	**$ 123.80**

10. Average debt for all residential accounts in debt

DPW does not retain responsive data.

11. Average bill for all residential accounts in debt

DPW does not retain responsive data.

12. Number of homes sold at tax sale with water-only liens

Tax Sale Year	Properties in Tax Sale due to Water Bills Only	Foreclosure on Properties Due to Water Bills Only Tax Sale
2012	763	4
2013	891	6
2014	1,441	2
2015	1,742	2
2016	1,341	0
2017	1,745	TBD

03/1/2018

Appendix C: List of Interviews

Date	Organization	Name(s)	Position	Meeting Location
1/8/17	Circle of Blue	Brett Walton	Reporter	Phone Call
1/12/18	Fisher, Sheehan and Cohen	Roger Colton	Partner	Phone Call
1/17/18	Food and Water Watch	Mary Grant	Campaign Director, Public Water for All	Phone Call
1/17/18	Suffolk University	Sharmila Murthy	Assistant Professor of Law	Phone Call
1/25/18	Baltimore Right to Water Coalition	Amy Heddon, Komal Vaidya, Rianna Eckell	Maryland Volunteer Law Service, University of Baltimore Law School, FWW	University of Baltimore
1/26/18	Maryland Municipal League	Jim Peck	Director of Research	Phone Call
1/29/18	Maryland House of Delegates	Mary Washington	Democrat, District 43, Baltimore City	Maryland State House
1/31/18	Baltimore City Council	Bill Henry	Councilman District 4	Baltimore District Office
1/31/18	Baltimore City Council	Zeke Cohen	Councilman District 1	Baltimore District Office
2/13/18	Neighborhood Housing Services of Baltimore	Dan Ellis	Executive Director	Phone Call
2/14/18	Department of Public Works	Kimberly Grove	Chief, Office of Compliance & Laboratories	Phone Call
2/16/18	Baltimore Pro Bono Legal Center	Margaret Henn	Project Manager	Phone Call
2/23/18	Department of Housing and Community Development	Michael O'Leary	Tax Sales Coordinator	Phone Call

Appendix D: City of Baltimore Application for WIFIA Funding

WIFIA PROGRAM

The Water Infrastructure Finance and Innovation Act (WIFIA) program accelerates investment in our nation's water infrastructure by providing long-term, low-cost supplemental loans for regionally and nationally significant projects.

COMPREHENSIVE INFRASTRUCTURE REPAIR, REHABILITATION AND REPLACEMENT PROGRAM

PROSPECTIVE BORROWER: Baltimore City Department of Public Works

LOCATION: Baltimore, Maryland

TOTAL PROJECT COSTS: $573 million

REQUESTED WIFIA LOAN AMOUNT: $200 million

POPULATION SERVED BY SYSTEM: 1.8 million people

PROJECT TYPE: Wastewater treatment plant, public water system, and stormwater management

PROJECT DESCRIPTION:

The City of Baltimore will complete a set of projects to repair, rehabilitate, replace, and upgrade its wastewater collection and treatment, water treatment and distribution, and stormwater management systems. These projects will help improve the city's sanitary sewer collection system; ensure the reliability and performance of the drinking water and wastewater systems; and improve stormwater management to meet Clean Water Act permit requirements.

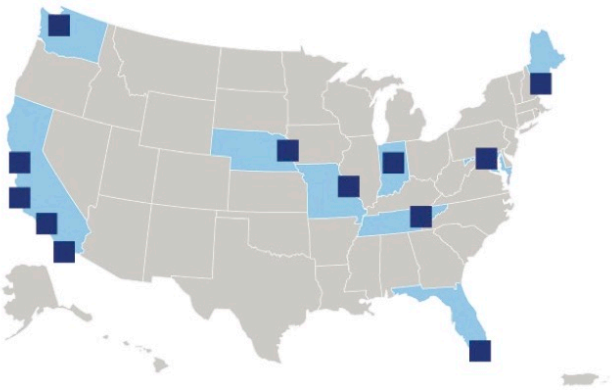
FY 2017 SELECTION ROUND

NUMBER OF PROJECTS SELECTED: 12

TOTAL LOAN AMOUNT: $2.3 billion to public and private entities

TOTAL WATER INFRASTRUCTURE INVESTMENT SUPPORTED: $5.1 billion

NUMBER OF PEOPLE IMPACTED:
20 million in 9 states



Selected projects must submit an application for a WIFIA loan, pass a creditworthiness assessment, negotiate a mutually agreeable term sheet, and execute a credit agreement to receive WIFIA funding. An invitation to apply indicates that EPA believes the selected projects will be able to attain WIFIA loans.

EPA United States Environmental Protection Agency

WEBSITE: www.epa.gov/wifia
EMAIL: wifia@EPA.gov

Appendix E: DPW Customer Assistance Programs

Baltimore City Resource Guide for
For Households with Water Shut-Off Notice

Utility Bills & Assistance

Department of Public Works **(Water Bill Issues)** 410-396-5398 Abel Wolman Municipal Building 200 Holiday Street Baltimore, MD 21202	For water bill disputes, request an informal conference from the Department of Public Works. For water leaks, call 311 to request the City to check for a leak. Request a credit from the Department of Public Works. For help getting an informal conference or credit, call legal resources listed on page 2.
Senior Citizens Water Discount Complete an application and mail it to Bureau of Water and Wastewater, Customer Support and Services Division, 200 Holliday Street, Room 404, Baltimore, MD 21202: Publicworks.baltimorecity.gov/portals/publicworks/Documents/Senior%20discount%20application%202015.pdf	The Senior Citizen's Water Discount program provides a 39% discount on water and sewer bills for seniors 65 and over. Applicants must own the home or have a lease in their name and have a household income of $25,000 or less. Homeowners must reapply every year.
Low Income Water Assistance Program You can apply at one of the Community Action Centers: http://humanservices.baltimorecity.gov/CommunityActionPartnership/HoursandLocations.aspx	Income eligible households that are not on a water payment plan are eligible for a one-time grant of $161. Homeowners must reapply every year.
Hardship Exemption from Stormwater and Bay Restoration Fees www.cleanwaterbaltimore.org/Flyers_Pdfs/Hardship/_Exemption_Application_2014_pdf	Homeowners who receive public assistance, VA benefits, or social security disability benefits and are income eligible may be exempt from Stormwater or Bay Restoration fees. Homeowners must apply every year**.**
211 Call 211 or visit www.211md.org/.	For information about assistance paying an electricity bill.
Baltimore City Housing Department LIGHT Program Apply through a housing counselor (listed on page 2) or a Community Action Center (listed below).	For information about housing repairs to help address high water bills, energy efficiency issues, or other housing related problems.

Housing Counseling

Neighborhood Housing Services of Baltimore 410-327-1200 ext. 104 819 Park Ave. Baltimore, MD 21201	Free housing counselor who can assist Baltimore residents with a mortgage who are facing tax sale. Case management assistance to homeowners without mortgages. NHS staff will go through available resources and help homeowners apply for available resources owing water and taxes to reduce tax and water bill and stay out of the tax sale. (April- June) NHS also has a small loan program for eligible clients facing tax sale who have an ability to repay. Call NHS for more details.
St. Ambrose Housing Aid Center 410-366-8550 321 W. 25th Street Baltimore, MD 21218	Free housing counseling that can help with foreclosure related issues including: tax sale, water bills and mortgages.
Southeast CDC 410-342-3234 3323 Eastern Ave., #200 Baltimore, MD 21224	Free housing counseling that can help with foreclosure related issues including: tax sale, water bills and mortgages.

Legal Resources

Maryland Volunteer Lawyers Service (MVLS) 443-547-6537 http://www.mvlslaw.org/	Free legal assistance with a water shutoff or tax sale matter. (Also assists clients with other civil legal issues). Clients must be income eligible.
Legal Aid Bureau 800-999-8904 http://www.mdlab.org/	Free legal assistance with a water shutoff or tax sale matter. (Also assists clients with other civil legal issues). Clients must be income eligible.
St. Ambrose Housing Aid Center 410.366.8550 http://www.stambros.org/	Free legal assistance with a water shutoff or tax sale matter. (Clients must reside in Baltimore City or Baltimore, Howard, Harford or Anne Arundel Counties). Clients must meet eligibility guidelines.
Public Justice Center 410-625-9409	Free legal assistance to **tenants**.

Assistance with Public Benefits & Alternative Housing Options

Maryland Access Point 410-396-2273 http://www.marylandaccesspoint.info/	For information about housing and resource options for seniors or people with disabilities.
211 You can also get information here: http://humanservices.baltimorecity.gov/HomelessServices/DocumentsandResources.aspx	For households facing homelessness.
Community Action Centers http://humanservices.baltimorecity.gov/CommunityActionPartnership/HoursandLocations.aspx Monday – Friday 8:30am to 4:30pm (Information about public benefits and programs).	Southeast Community Action Center: 410-545-6510 Eastern Community Action Center: 410-545-0136 Northwest Community Action Center: 443-984-1384 Southern Community Action Center: 410-545-0900 Northern Community Action Center: 410-396-6084

Appendix F: Baltimeter Fact Sheet

Fact Sheet

Baltimore's water billing system is in for an upgrade. Here's what you need to know about BaltiMeter Billing.

BALTIMORE CITY DPW DEPARTMENT OF PUBLIC WORKS

- In October of this year, the Department of Public Works (DPW) will implement BaltiMeter Billing. This new water and sewer billing system is part of an investment to modernize the City's infrastructure and ensure DPW's goal of an efficient and reliable billing service long into the future.
- The current 1980s-era billing system is outdated and does not produce a customer-friendly bill format. BaltiMeter Billing offers customers an easy to read bill, clearly showing how much water is used, how much money is owed, and other useful information.
- In addition to a new bill format, the billing cycle will change from quarterly to monthly. Monthly billing makes it easier for customers to manage household budgets, detect leaks sooner, and find opportunities to adjust household water usage.
- Monthly bills will now only be based on how much water you use, not a minimum, and will clearly show each cost your bill covers. Including the fixed cost you already pay for account management and infrastructure investment.
- As water conservation initiatives have grown and the importance of customer service through different channels has been emphasized, most water utilities are moving to monthly billing and the inclusion of fees for administration and infrastructure.
- An Account Management Fee helps pay for the cost of administering your account, and an Infrastructure Fee helps pay for the cost of upgrading our aging pipes and plants. Under the old billing system, these fixed costs were included in the quarterly water and sewer rates.
- The Stormwater Fee and Bay Restoration Fee will also be billed in monthly amounts, rather than quarterly.
- The conversion to the modern BaltiMeter Billing system provides customers the ability to see daily household water and other account information online. Each property owner will receive an individual password to log in to their secure online account.
- By having more information regarding their water consumption, customers will have more control over their water usage and expenses.
- Please view the "Understanding Your New Water Bill" document on the website for an example of what your bill will look like.
  publicworks.baltimorecity.gov/waterbilling

Appendix G: DPW Sample Water Bill

Understanding Your New Baltimore City Water Bill

1. Account Summary
Information about the account, including your new account number.

2. Alerts Box
Important messages regarding your account or service will be displayed here

3. Historical Usage
Shows the account's water usage trends for the past month and over the previous 12 months. This tracking will begin with your first monthly bill.

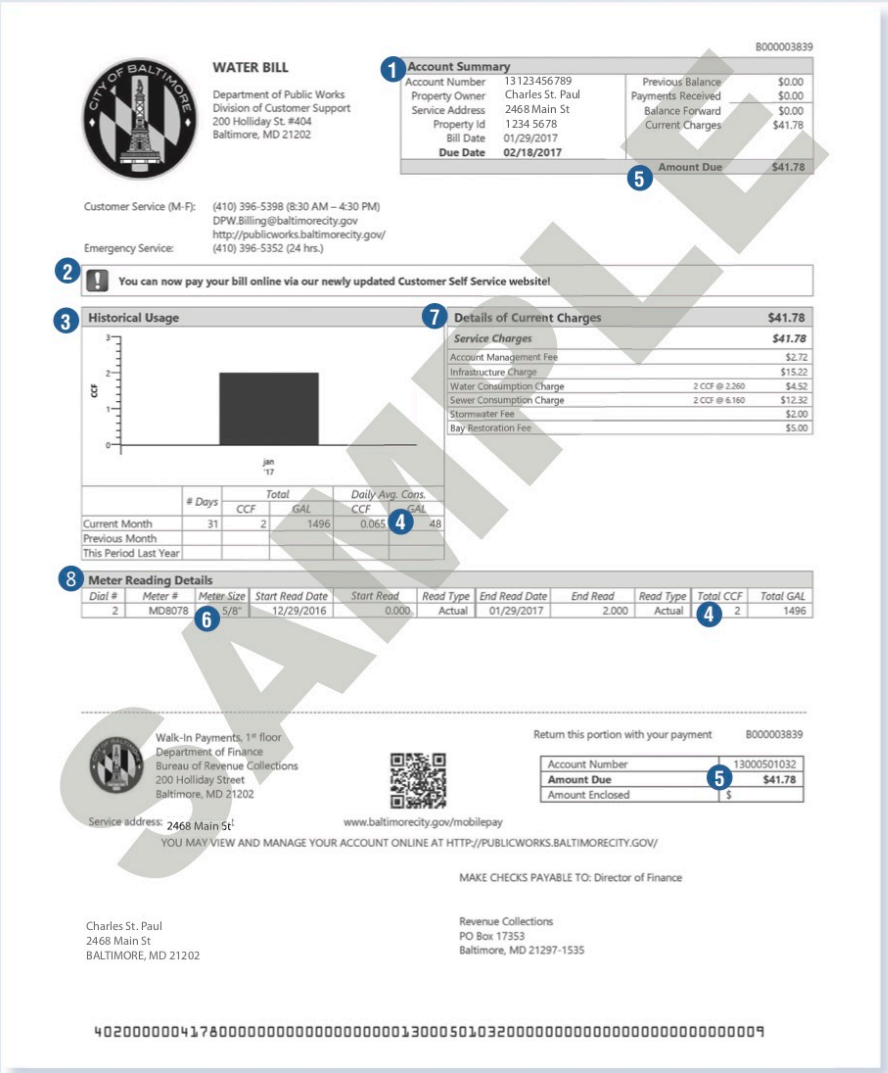
4. CCF
A CCF is 100 cubic feet of water; about 748 gallons.

5. Amount Due
What is owed by the due date; payments after this date will be charged a late fee.

6. Meter Size
Meters start at 5/8 of an inch and increase in size depending on the need of the customer

Easier to Read
Easier to Pay

Contact:
DPW.Billing@baltimorecity.gov
or (410) 396-5398
PublicWorks.BaltimoreCity.gov



7. Details of Current Charges includes:
The various fees that make up the bill; any discounts that apply to the bill; and any other activities on the bill that month.

- **Account Management Fee** represents the costs to provide customer service and related support services to our customers and their accounts;
- **Infrastructure Fee** goes toward the cost of reinvesting in our pipes, plants, and other assets that benefit all customers.

8. Meter Reading Details
Summary of the meter reads, including the reads at the beginning and end of your billing cycle. The difference between these two reads is how much water was used during that period.

BALTIMORE CITY
DPW
DEPARTMENT OF PUBLIC WORKS

BaltiMeter
Efficient Reliable Accurate
Billing