WHITE PAPER

AMERICAN WATER

April 2013

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The "One Water" Approach

Introduction

Of all of our needs, water is the single most important. It is a life essential resource – we need it every day for almost everything we do and there is no substitute. In the U.S., water services are often so reliable that many of us do not think twice about what comes out of our faucets or what it's been through to become drinkable. Indeed, for many of us, having access to clean, dependable water is a given, not a luxury. Water is taken for granted and this has led to a real problem with serious consequences.

The challenges of infrastructure replacement and compliance with water quality requirements are increasing for utilities.

Much of our drinking water infrastructure is nearing the end of its useful life and approaching the age at which it needs to be replaced. Some of these pipes –originally intended to survive 50 to 75 years – have been in service for more than 100 years. Without renewal or replacement, water pipes in the U.S. that are classified as poor, very poor or life-elapsed will increase from 10 percent to 44 percent by 2020[1].

The entire cycle of the water process is affected, and, according to the American Society of Civil Engineers (ASCE), restoring existing water systems as they reach the end of their useful lives and expanding them to serve a growing population will cost at least $1 trillion over the next 25 years, if we are to maintain current levels of water service[2].

So far, water utilities have been successful in keeping up with regulations and maintenance, despite stagnant funding and uncertainty about when infrastructure could fail altogether. But the staggering cost to contend with these issues forces a new paradigm — how to best manage the ever-increasing demands on our water, wastewater and stormwater infrastructure with fewer dollars[3].

Infrastructure

It's no secret that our nation's aging water and wastewater infrastructure is in critical need of repair, mainly due to the fact that our country has underinvested and has not paid what it really costs to maintain a system of pipes and plants that ensures our health and economic stability.

The risks of allowing these systems to lapse are as real as they are alarming. Already, aging wastewater systems discharge billions of gallons of untreated wastewater into our surface waters every year. Leaking and broken pipes waste nearly two trillion gallons of clean drinking water each year. And every two minutes, somewhere in the U.S., a significant water line ruptures – oftentimes underground where it is not visible – risking major damage to roadways and structures.

[1] EPA: "The Clean Water and Drinking Water Infrastructure Gap Analysis"
[2] American Water Works Association (AWWA): "Buried No Longer: Confronting America's Water Infrastructure Challenge."
[3] Burns & McDonnell: "Changing the Water Cycle" 2011.

Ironically, the perceived cost savings from putting off investments in infrastructure now would likely be trivial compared to the cost of replacing the systems if they should fail. Many utilities are forced into crisis situations by making quick fixes, such as water main breaks. But the real problem of upgrading infrastructure that is at the end of its life or has outlived its life expectancy is being ignored.

These problems persist throughout the country, with residents in almost every major city feeling the effects. In Baltimore aging pipes now burst approximately 1,000 times per year, and every day an incredible 20 percent of the water drawn from nearby reservoirs is simply lost in transmission before ever making it to homes and businesses. In Houston an estimated 40 percent of the city's water pipes have already reached the end of their intended operational lives, and last summer's heat wave and drought conditions caused the city's aging water system to sprout an overwhelming 11,000 leaks, resulting in a quarter of the city's water being lost or unaccounted for in September and October 2011. The dilapidated sewer system that serves Miami was recently found to have ruptured some 65 times in just the past two years, discharging more than 47 million gallons of untreated sewage into waterways and streets.[4]

Challenges

Black & Veatch's 2012 U.S Water Utility Industry report states the ongoing practice of classifying water into different categories (potable, stormwater, wastewater) creates division about water value and its potential uses. It argues the term "wastewater" should be eliminated altogether, saying it's time to shift focus away from the elimination of something undesirable to the opportunity of recovering valuable resources, such as water, energy and nutrients.

Drinking (Potable) Water is intended for human consumption. As such it must meet federal safety requirements. The average American uses 100 gallons of drinking water per day, only a small fraction of which is used for drinking. The rest is used for toilet flushing, bathing, cooking, landscape watering, and the like.

Wastewater has been used for any residential, commercial or industrial purpose and contains liquid or solid waste products (sewage, factory discharges, etc). The average American produces 60 – 150 gallons of wastewater daily, primarily from washing dishes and clothes.

Stormwater is water from rain or snowmelt. Stormwater that is not absorbed into the ground or waterways flows into storm drain systems where it must be treated for pollutants before being released.[5]

There is a growing consensus that such siloed systems are not effectively adapted to the challenges that the water industry will face in the 21st Century. Furthermore, they do not allow for an integrated approach to managing for mutual benefits and harnessing the value of the resources. Several negative consequences result, one of which is financial[6].

Because water systems are rarely integrated, many households and businesses are being serviced by two to three different water utilities. This means that the water-related debt burden for households and businesses may be multiples of the average system's long-term debt per household. If drinking water utilities' unmet capital needs are representative of the water sector as a whole, the upfront capital and resulting rate increases that will be sought as these systems age could accumulate to present real affordability challenges to customers. [7]

Integrated Water Resource Management

There is no doubt that some regions of the country are experiencing water supply challenges, particularly in parts of the west, southwest and southeast. We take our responsibility as stewards of this precious resource very seriously, and as such, are committed to finding sustainable ways to treat and deliver water.

[4] Center for American Progress: "How to Upgrade and Maintain Our Nation's Wastewater and Drinking Water Infrastructure."
[5] National League of Cities: "Sustainable Cities Institute" 2012.
[6] The Johnson Foundation: "Charting New Waters: Financing Sustainable Water Infrastructure" 2012
7 The Johnson Foundation: "Charting New Waters: Financing Sustainable Water Infrastructure" 2012

Because clean water is such an essential component of people's health, our economy, and our environment, managing this resource demands a more holistic and integrated approach with our communities, which considers the whole water cycle. Integrated Water Resource Management (IWRM) focuses on understanding all of the water resources available to the communities we serve and working with others in the communities to active care for those resources, and providing solutions that best match an area's water needs and constraints. Costs can be saved by rethinking the way water is managed and, more importantly, where in the water cycle management and treatment is most effective.

We have sources of water, which include surface water, well water and reuse water, which are treated and used for different purposes. Do we need to water our lawns with the same high quality of water we drink? This is the type of question our country needs to be asking.

It is incumbent upon utilities and their regulators to identify and implement, as appropriate, best practices to facilitate capital attraction, economies of scale and efficient operations if these challenges are to be met in a cost-effective manner. Many factors outside of the traditional regulated framework or Public Utilities Commission jurisdiction can directly impact the cost and reliability of service to regulated customers. For water service providers it can mean long-term planning incorporating concepts of reuse, watershed protection, wastewater management, groundwater infiltration and recharge, among others.

American Water's large size and technological expertise make it an ideal partner in leveraging the IWRM process. By practicing IWRM, American Water and its partners have been able to preserve water sources and use water wisely while considering the needs of the public and relevant stakeholders.

"One Water" Solution

So what's the solution? A different approach to how our water resources are valued and how protection and renewal of this limited resource is managed and funded.

The bottom line is that it is "one water" — the same water cycling through our infrastructure repeatedly. According to Black & Veatch's U.S Water Utility Industry Report, the overall analysis in survey responses emphasizes that water is water. Water utilities are all essentially managing the same water resource, diverted from nature's one-and-only water cycle[8]. But in managing each stage of the cycle — drinking water, wastewater and stormwater — each is considered individually. That's three utilities regulated separately, managed separately and competing for the same limited funding[9].

For example, the need to rebuild pipe networks must come on top of other water investment needs, such as the need to replace water treatment plants and storage tanks, and investments needed to comply with standards for drinking water quality. They also come on top of wastewater and stormwater investment needs, which — judging from the US Environmental Protection Agency's most recent "gap analysis" — are likely to be as large as drinking water needs over the coming decades.[10]

American Water is challenging people to think about the broader notion of "One Water." This term describes the company's long-term strategy of not thinking about individual segments of water, but rather thinking that it's all water, and it's all a resource. Additionally, it can be used for different purposes and it's thinking about the system holistically, from the start of the watershed through to the various points of use.

And not only are utilities thinking this way. The Clean Water America Alliance recently announced a name change to the U.S. Water Alliance and the formation of a One Water Management network to reflect the "One Water" unity. According to the Alliance, the concept of "One Water" flows from the developing scientific evidence that the current narrow definition of water policy, and our divisions of it into separate management silos, do not adequately reflect the real world. For example, stormwater is often a valuable water supply source. Yet in many locations, it is treated and managed as if it were a waste or a problem. Similarly, water reuse and groundwater recharge are often afterthoughts. And environmental flows to

[8] Black & Veatch: "U.S. Water Utility Industry Report" 2012.
[9] Burns & McDonnell: "Changing the Water Cycle" 2011.
[10] AWWA: "Buried No Longer" America's Water Infrastructure Challenge"

sustain necessary habitats are frequently shoe-horned into water policy through the back door of the Endangered Species Act, rather than as a primary objective of water policy[11].

According to Black & Veatch's report, sometimes the management of multiple resources is synergistic; sometimes it requires more complex planning or investment; and sometimes tradeoffs are necessary. These divisions also contribute to communications challenges with public and government entities that can confound capital projects and resource recovery efforts. Globally, organizations that integrate water and wastewater functions find it easier to balance their water portfolios and gain public and financial support for investment in water infrastructure.

Additionally, a report issued by the Johnson Foundation at Wingspread, American Rivers and Ceres, concludes that municipalities and private water systems will need new strategies to cope with emerging problems and threats. The report states, "We have to integrate all water systems to use the 'right water for the right need. We must start extracting the significant resources (nutrients and energy) found in wastewater rather than discarding them as waste."[12]

Financing

Another aspect to "one water" is financing. In Pennsylvania, House Bill 1294 (Act 11) has now passed both houses and been signed by the Governor with no amendments adverse to the water industry. The bill contains a number of positive provisions, including extension of DSIC to wastewater, the ability to use a future test year, and exempts a utility that serves water and wastewater customers from segregating each type of service when setting rates.

Other Innovative Solutions

American Water invests $800 million to $1 billion in its systems annually to ensure the continued delivery of high-quality water to its customers. The lion's share of the annual investment is to renew, replace and extend the underground lines, valves and meters that aren't seen but are the means by which customers are served.

The company also invests in innovative solutions for water quantity and quality challenges. The use of innovative technologies, such as advanced metering and sensing systems to help detect and stop losses of treated water, water reuse and desalination of sea water or brackish water sources, helps maximize water resources. American Water is focused on the development and use of innovation and technology to provide solutions to these challenges.

Water reuse: Water utilities are increasingly considering how they can effectively recycle and reuse any wastewater generated. American Water has ongoing water reuse initiatives in a number of regions. This area is also receiving growing attention in Brazil, where specific regions have increased production of water treatment for use in industrial applications[13].

American Water's work in the area of water reuse or water recycling is also a key element in water conservation and preservation. Drinking water accounts for only one percent of overall water consumption. As such, tremendous opportunity lies in reusing water for a variety of other non-potable (non-drinking) purposes. Our work in this area includes reuse systems for residential use such as five residential high-rises in Manhattan's Battery Park City; commercial development such as malls and sports facilities like Gillette Stadium, the home of the New England Patriots in Foxboro, Mass.; as well as for municipalities, such as our partnership with the city of Fillmore, Calif. for a full-sale water recycling program.

Where water is scarce or of impaired quality, discussion tends to focus less on overcoming the "yuck" factor and more on providing the flexibility to match water quality to a specific use. For example, water

[11] The Clean Water America Alliance; http://www.cleanwateramericaalliance.org/
[12] Johnson Foundation at Wingspread, American Rivers and Ceres.
[13] Oracle: "Water For All Study" 2012.

used to flush toilets or water lawns shouldn't require the same advanced treatment as water intended for aquifer recharge but does require third-pipe distribution and appropriate regulatory oversight[14].

According to a GE consumer survey unveiled in October 2012, two thirds of Americans (66 percent) feel positive about water reuse, according to the survey of 3,000 consumers in the U.S., China and Singapore. The survey reports that Americans also think that industry and government should play a stronger role in making water reuse a priority.

Additionally, while the majority of Americans hesitate at the concept of "toilet-to-tap" recycling, more than 80 percent of Americans surveyed indicated that they support using recycled water for many "toilet-to-turf" uses — activities that require significant amounts of non-potable water, such as agricultural irrigation, power generation, landscaping, industrial processing and manufacturing, toilet flushing, and car washing[15].

Desalination: With seawater comprising 97 percent of the earth's water, one viable solution is desalination – the removal of salt from brackish (saline) water or seawater. This technology has been successfully implemented around the world, and has been proven to meet the needs of residents that would otherwise have no local access to drinking water.

American Water, partnering with Tampa Bay Water, operates the U.S.'s largest seawater desalination plant in Tampa Bay, providing up to 10 percent of that region's total water supply. As desalination technology improves and its costs decrease, it has clearly become a viable alternative to environmentally stressed groundwater and surface water supplies used for drinking water.

Leak detection: One of our most critical questions for the future centers on how communities can significantly reduce consumption and ease the strain on our nation's water supply. With approximately 7 billion gallons of treated drinking water "lost" each day primarily due to leaks in drinking water pipelines throughout the U.S.,[16] one viable solution is leak detection.

For water utilities, detecting and repairing leaks is one of their main components for water conservation. Results of deteriorating infrastructure, fluctuating water temperatures, soil movement, vibrations and water pressure changes are just some of the factors contributing to water leakage. And not only do leaks account for lost water, but they can also allow contaminants into the system that can endanger public health. It is estimated that up to 10 billion gallons of raw sewage is released into our waterways every year as a result of blocked or broken pipes.[17]

According to the American Society of Civil Engineers Report Card for America's Infrastructure, national drinking water systems received the grade of D. Over the last several years, many studies have been undertaken to estimate water loss. Regions of developing countries are experiencing greater water loss than regions in developed countries and North America alone is experiencing 12.3 percent of non-revenue water.[18],[19]

American Water has developed comprehensive water preservation and efficiency strategies employing leading technologies and makes capital investments that directly benefit the community. We have pioneered the use of leak detection technologies to help detect and stop leaks of treated water before they become breaks. We have been employing this new technology in our systems nationwide. Our work in the leak detection area limits leaks, improves water pressure and preserves water.

Conclusion

While each stage of the cycle — drinking water, wastewater and stormwater has a little different slot in the water cycle, they are inseparable in the larger context of water quality and supply and water for future

[14] Black & Veatch: "U.S. Water Utility Industry Report" 2012.
[15] GE consumer survey, October 2012.
[16] American Society of Civil Engineers. "Report Card for America's Infrastructure." 2009.
[17] ITT Corporation, "The Value of Water Survey: Americans on the U.S. Water Crisis," 2010
[18] Global Water Intelligence. "Global Water Market 2008 Opportunities in Scarcity and Environmental Regulation." 2008.
[19] Non-revenue water is water that has been produced and is "lost" before it reaches the customer.

generations. We can no longer look at each sector separately. By continually investing in our systems, as well as innovative technologies that increase efficiency and sustainability, American Water is committed to addressing these challenges. When the infrastructure is reliable and functioning smoothly, there is less water loss, leaving a larger supply of water available for society. The cycle of water comes full circle.

We need to look at water management in a more holistic way – thinking about the whole impact on the environment. However, one lesson should be clear in the minds of all involved in the decision making process—it costs significantly less to maintain and enhance an existing system than it does to build or replace one[20].

[20] Black & Veatch: "U.S. Water Utility Industry Report" 2012.