Aging systems discharge billions of gallons of untreated wastewater into US surface waters each year. The US Environmental Protection Agency (USEPA) estimates that approximately 4,000 to 5,000 mi of drinking water mains are replaced annually, and this annual replacement rate is projected to peak around 2035 when it is anticipated that 16,000 to 20,000 mi of aging pipe will be replaced each year (USEPA, 2009). Meanwhile, pipes installed during the middle of the twentieth century are likely to begin to fail in large numbers. According to the American Society of Civil Engineers 2013 Report Card for America’s Infrastructure, USEPA estimated the nation’s 20-year investment need at nearly $334.8 billion, a conservative figure that did not consider population growth (ASCE, 2013).

Other pressures on US drinking water systems also affect the cost of infrastructure. The financial burden of meeting regulatory requirements is a continuing issue for many communities. In the case of drinking water systems, the most pressing rules are new ones—either recently issued or pending—that are the result of standard-setting by the USEPA to implement the Safe Drinking Water Act Amendments of 1996 (USEPA, 1996). These...
rules impose new or stricter drinking water limits on numerous contaminants, including arsenic, radioactive contaminants, microbials, and disinfection by-products. Meanwhile, utility funding has remained at the same level, often requiring localities to designate fewer dollars for routine maintenance. In addition, capital improvement projects are crippled by inefficient processes that are made worse by poor information management practices. These practices create unnecessary risks as well as countless opportunities for delays, cost overruns, or both.

Given these challenges, water and wastewater providers must do all they can to optimize all aspects of their operations. One tool that utilities may overlook is cloud technology as a way to become more efficient and cost-effective at delivering capital improvements. Faced with insufficient public funding and scrutiny from the USEPA, water and wastewater agencies must take action to reduce the costs and time needed to deliver these projects. Improvements resulting from cloud-based technologies can help utilities accomplish more work and provide tangible savings that may be reinvested as needed.

In 1995, the Washington Suburban Sanitary Commission (WSSC), a bi-county water and wastewater utility in Laurel, Md., became one of the first organizations to manage capital improvement project information on the Internet (ENR, 1996). At the time, WSSC was recognized as a pioneer for embarking on this innovative approach to addressing communication and collaboration issues.

In 2013, WSSC continues to adopt cutting-edge technology to boost productivity across many processes, including daily inspection reporting and change-order tracking. These measures have reduced bottlenecks that can contribute to project delays, fines, and cost overruns. The lessons learned and success achieved by WSSC offer a model that other agencies can emulate to realize similar success.

The financial burden of meeting regulatory requirements is a continuing issue for many communities.

Since 1995, the Washington Suburban Sanitary Commission has been managing project information on the Internet and using automated software systems to streamline administrative processes. Less time spent on paperwork means more time in the field.
WSSC was not alone in this endeavor; the federal government has issued consent decrees dating back to the 1990s to several wastewater utilities to overhaul existing systems (e.g., MDWASD, 2013).

The enhancements WSSC agreed to in the consent decree included the Fats, Oils, and Grease Program. The program now includes physically inspecting 8,000 food establishments and issuing active discharge permits to those who qualified in both of the counties served by WSSC. This places an additional burden on a system already strained with a backlog of projects. “We have so much pipe to replace we could do a hundred miles a year and that would put us on a hundred-year life cycle,” admits Keith Tyson, Systems Inspection Group construction manager at WSSC’s Laurel Depot. Tyson and his colleague Mike Trail, Systems Inspection Group construction manager at the Anacostia Depot in Hyattsville, Md., face a daily challenge of managing a mountain of data while maintaining the system and meeting standards.

One tool that utilities may overlook is cloud technology as a way to become more efficient and cost-effective at delivering capital improvements.

One way to improve the process is to address inefficiency. WSSC is constantly looking for ways to streamline operations. During an internal audit of the Systems Inspection Group, concerns were raised about the processes used to execute daily inspection reports. The trouble stemmed from the heavy use of spreadsheets to document projects. The processes in place dictated that information be copied, consolidated, and transferred multiple times across multiple spreadsheets throughout the month, including the projects under the consent decree. Because every project had its own spreadsheet, the data from one contract could end up in as many as 20 different spreadsheets. The sheer number of spreadsheets made data entry a cumbersome and time-consuming undertaking and turned analysis into a challenge.

WSSC inspectors, charged with observing and reporting on work being completed, are responsible for up to four projects each. Mike Trail describes the failings of the old process. “Under the old way of preparing our daily inspection reports—and in the best conditions, such as using a laptop in the field and having a WIFI card working efficiently—it would take an inspector about 20 minutes to fill out three to seven reports, or between 40 and 80 minutes daily. This took away from inspection time.”

For their monthly report, inspectors took the daily estimate information compiled in the spreadsheets and re-entered that data into another tracking spreadsheet. From there, it passed through two more individuals, who checked the information for accuracy and then transferred it again from a monthly tracking sheet to the monthly report spreadsheet, which was then checked a second time. Collectively, these efforts took between 3 and 4 h and were fraught with potential errors.

The integrity of the data was at risk. “Under the old way we did
things, you could have multiple versions of the same report floating out there somewhere,” reports Trail. Without the means to track changes to the groups’ daily inspection reports, errors could be costly. As Keith Tyson explains, “We’re paying the contractor based on the information that is being inspected in the field. If for some reason this information was changed and there’s no way to track the change, then the contractor might be paid twice, paid more, or paid less than he was supposed to [be paid].”

Tyson notes the toll that such inefficiency took on the process. “There was a lot of duplication of efforts and transferring numbers back and forth, not to mention the high potential for error.” For example, when contractors updated a spreadsheet, construction managers would have to cut and paste the new information into the WSSC spreadsheet in order to create the most up-to-date file. Mike Trail admits, “We would sometimes miss or copy over things.”

Simply accessing the data was difficult as well. Although inspectors were provided WSSC-issued laptops and an air card, getting on the shared drives via the utility’s cloud computing service proved extremely slow. “It got to be so tedious with the air card that people just abandoned it and started doing work in the office in the morning,” Trail says. “They would spend an hour and a half in the office in the morning and then head out.”

**Cloud-based technologies offer WSSC a better way.** The cloud has made it possible for agencies managing capital improvements to be more efficient and more productive. Cloud-based project information management systems have been in existence for two decades. Construction companies were early adopters, but the pendulum swung to project owners who demanded flexibility in structuring how to capture, communicate, and analyze project information.

Cloud-based systems are enabling project participants to spend more time on the activities that are crucial in keeping projects moving forward. Repetitive and time-consuming tasks can be automated to reduce the time needed to complete them.

In WSSC’s case, the utility’s Project Delivery Group had been using the first web-based construction project management system to facilitate construction information management since 1995. It wasn’t until 2009, however, that a mandate was issued to changeover all WSSC depots to the program. Keith Tyson explains, “My charge when I came in was to build this process to get the inspection report streamlined. The goal was to get away from spreadsheet applications that WSSC-issued to changeover all WSSC depots to the program. Keith Tyson explains, “My charge when I came in was to build this process to get the inspection report streamlined. The goal was to get away from spreadsheet applications that were provided to inspectors in order to verify the document’s accuracy. For the contract managers, the efficiencies stem from having to check only a single report. Collectively, the group is saving approximately 32 h/d. Saving time means saving money; Tyson estimates that WSSC saves more than $333,000 annually because of these increased efficiencies.

The new process has also resulted in significantly faster data entry because information is entered just once. Mike Trail explains, “We have to fill out only one report to take the place of three to seven separate reports. Any additional reports that we fill out are now tracked by preset reports run through our system.”

**Real-time reporting guarantees up-to-the-minute data.** A key aspect to demonstrating compliance with
US drinking water systems face an uphill battle as they replace aging facilities that are near the end of their useful lives and as they comply with existing and future federal water regulations.

and trusting that the information provided to USEPA is accurate.

Talk to any organization trying to manage its project data through a network of spreadsheets, and you’ll get an earful about the frustrations associated with compiling information to generate different reports for different stakeholders. Some of the more common words used to describe these reports are “inaccurate,” “outdated,” and “incomplete.” When it comes to data management and real-time reporting, cloud-based information management systems put cumbersome spreadsheets to shame. “We’re tracking all of our work orders for our consent decree compliance through the construction program management software now,” Keith Tyson explains. In addition, reports can be generated on individual system components. “We’re not just doing daily reports, we’re doing individual reports on individual pieces of pipe or individual addresses that get renewed as part of our USEPA consent decree.” WSSC is now able to upload those costs into the mainframe work order system so the commission can run the reports for USEPA and provide updates on work completed.

All work outlined by USEPA must be completed by December 2015 in both of the Maryland counties served by WSSC. That timeline means that numerous big contracts are using the new process. When inspectors fill out a work order, that information goes into the automated system, and the data are transferred once a week into the mainframe work order system. Data are then transferred to a database that the Sewer Analysis Unit uses to generate a report that is provided to USEPA. “The way we did it previously,” Tyson remembers, “we’d have to log on to the mainframe system and update every work order manually.”

Rather than collect information every month for a regular report, WSSC staff can draw on the data already in the system. “There is no longer a set date of the month that I have to have my monthly report done by,” says Trail. “We just do our jobs, and our boss runs the report anytime he wants to find out exactly how much footage we’ve completed to date.” Real-time data are at users’ fingertips. “Sometimes at the drop of a hat, the general manager will call down to our chief engineer and ask about our current mileage,” Trail adds. “Before, we had to go through a bunch of spreadsheets and tally it up for each depot. Now the chief engineer just runs one report, which takes about 30 seconds, so he can give it to the general manager right there over the phone.”

Automated system also results in increased transparency and built-in audit capabilities. Spreadsheet-based systems, a common method used to track project information, lack accountability and auditability. WSSC’s current automated system provides a degree of protection so that as daily inspection reports are approved, individuals cannot go back and modify them, remedying concerns raised during the internal audit. The newfound transparency keeps depot managers informed about who is checking reports on a daily basis. “It allows our group leader to stay on top of who’s doing their work and who’s not,” says Mike Trail. That same visibility enables contractors and inspectors to view, store, and exchange information related to sewer projects on a daily basis. “These spreadsheets are live and working documents,” Trail notes.

Contractors also appreciate that they can access information more expeditiously than in the past. “Now we can run a daily item-estimate-sheet report that shows how much work has been completed,” Keith Tyson states. “The contractor can run the same report and see exactly what’s been approved and what he should be getting paid for. The contractor has visibility into the accounting on a daily basis instead of just at the end of the month.”

Process reduces errors and ensures access to both current and archival material. At WSSC, the practice of cutting and pasting data from one spreadsheet to another is now a relic of the past. “With the new process, there are no errors in transferring redundant information to multiple reporting spreadsheets,” Trail points out. In addition, keeping track of the most up-to-date version of a report is no longer a concern. The system’s file-sharing features ensure that people are working on or looking at the most current version of a document. At the same time, should WSSC ever need to access an early version, it will be available because the system creates a document history.

SUMMARY

US drinking water systems face an uphill battle as they replace aging facilities that are near the end of their useful lives and as they comply with existing and future federal water regulations. Delivering these projects in a cost-effective and efficient manner is a process rife with risks, some of which can be controlled. By moving
to the cloud-based technology that has a proven track record, water agencies can successfully mitigate these risks. The end result is a project delivery process that is more efficient, less costly, and more transparent and also helps utilities comply with aggressive deadlines to meet increasing demands.

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FOOTNOTES

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