

Las Vegas Valley Water District on the Cutting Edge of Aging Water Infrastructure Management and Leak Detection.

About The Global City Teams Challenge

The Las Vegas Valley Water District (LVVWD) leak monitoring project is a water conservation showcase site for The Global City Teams Challenge, a collaborative network of project teams or “action clusters”, working on innovative applications of Internet of Things (IoT) technologies within a smart city / smart community environment. The program is administered by the U.S. Department of Commerce’s National Institute of Standards and Technology (NIST). Project partners for the LVVWD water conservation project include AT&T, IBM, Mueller Water Products and the Nevada Center of Excellence. The project team selected water sustainability as its theme as the availability of fresh water resources is a problem effecting millions of people around the world. The project team set out to demonstrate that new technology approaches which are available today can help support a more sustainable plant.

Aging Water Infrastructure

Throughout the United States, water districts and utilities face a number of critical challenges including aging pipeline infrastructure, drought, funding shortages and an aging workforce in sole possession of critical system information. These challenges are forcing water utilities to adopt strategies that will help them evaluate and better manage the future operation of their systems.

For most utilities, buried water pipelines represent the largest value asset within their system and typically carry replacement costs in excess of \$1,000,000 per mile. A significant amount of these assets were installed in the 1950s and are now reaching the end of their useful service life. Water main breaks are the first visible impacts of aging water infrastructure, wreaking havoc on municipalities as pipes reach the end of their service lives. Small leaks are often referred to as “ticking time bombs” that go undetected for months, before revealing themselves as puddles, pressure drops, non-revenue water or devastating ruptures that flood streets and create property damage.

In systems that deliver water to more than 100,000 people, **30%** of the pipes are **40-80 years old**.¹



Estimates from the World Bank suggest that on average up to **20-30%** of a utility’s water is lost in the network as non-revenue water. Worldwide, this loss is estimated to cost **USD14 billion** per year to utilities.²

About the Las Vegas Valley Water District (LVVWD)

The LVVWD is a not-for-profit agency that began providing water to the Las Vegas Valley in 1954. The Water District helped build the city’s water delivery system and now provides water to more than 1 million people in Southern Nevada.

The District’s first major undertaking is one of the most important achievements in Southern Nevada’s history: the District created facilities to bring water from Lake Mead to the Valley. This provided a reliable water source for the city, and also helped create one of the world’s most popular resort destinations and America’s youngest major metropolitan area.

From the beginning, the District has been committed to providing a safe, reliable water supply. Over the years, the District has built more than 4,100 miles of pipeline, created a reservoir system capable of storing 900 million gallons of water and implemented a sophisticated water-quality monitoring program.

Situation

Leaks, big and small, waste water. For ratepayers, they can drive up the cost of water bills and in large pipelines, they can erupt into a major disaster. Most of the LVVWD's known water losses are due to failed small diameter service lines. To find leaks on small diameter service lines, the District employs leak detection devices that periodically listen for sounds or vibrations that maybe caused by water seeping from the system. To find leaks on large pipelines, the district manually surveys critical pipelines using sophisticated leak correlation equipment. But now, newer more advanced LTE enabled acoustical sounding technology is enabling the District to permanently monitor for leaks on one of the community's older and most in demand water lines located in the heart of the Las Vegas Strip. Installed in 1960's, the 30-inch water main supplies up to 7.5 million gallons of water per day to resorts, casinos and attractions.

Charles Scott, LVVWD Engineering Project Manager describes the challenge. "The pipe was put in sometime around 1963. We had done some inspections of the pipe using a different technology. We were able to determine that several sections of the pipe were pretty much degraded. But we didn't really have a history of failures in the pipeline. So the dilemma was do we replace the pipe before it really

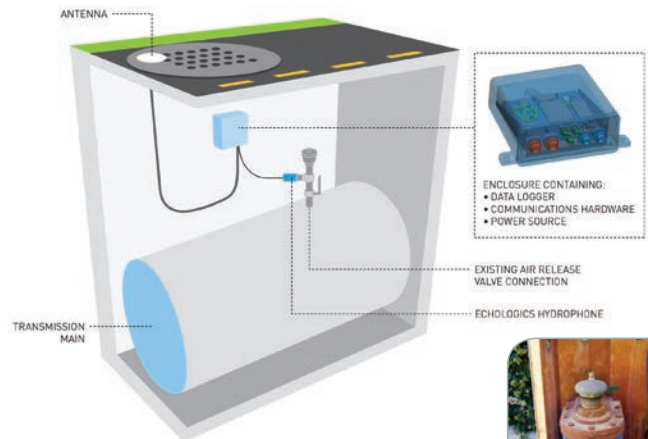


Since 2004, LVVWD has detected more than 1,600 underground leaks, saving an estimated 290 million gallons of water.

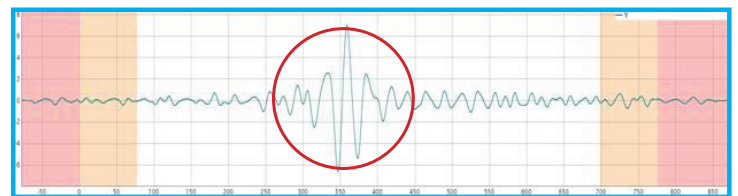
fails, or do we keep waiting until it fails and then replace it. And do you really want to spend a lot of money digging up the Strip every thousand feet or so and replacing these few sections that we think are bad." The District had a common challenge that is faced by water system operators each and every day.

Solution

LVVWD deployed Mueller Water Products' EchoShore®-TX permanent leak detection platform. The smart technology enabled LVVWD to better understand and manage the critical water supply pipeline and to reduce any potential water loss due to leakage. The monitoring platform combines proven acoustic leak detection technology with leading-edge AT&T wireless connectivity and visual end-user dashboards to create a cost-effective monitoring solution. In Las Vegas, 13 permanent acoustic sensors are monitoring 3 miles of the aging pipeline installed under Las Vegas Boulevard, from Sunset to Flamingo Roads.



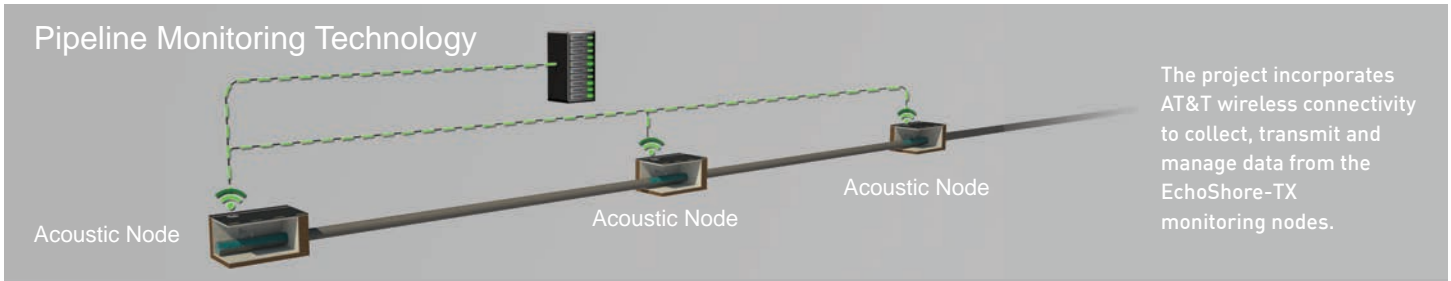
Permanent acoustic sensors installed in chambers are monitoring 4 miles of the water main pipeline installed under Las Vegas Boulevard.



Acoustic nodes detect a leak which was simulated during commissioning of the EchoShore-TX system – leak is circled in red. The acoustic signal of the leak clearly differentiates itself from the normal acoustic noises with the water main. IBM smart water management solutions use this information to enable utilities to become proactive, predictive and prescriptive.

"When this technology came along, it allowed us to think outside the box and say, really, the pipes don't fail catastrophically all of a sudden. They fail by having a very small leak which developed to a larger leak which eventually develops into a sink hole. So by having this technology we're allowed to monitor the pipe on a continuous basis to detect those small leaks before they get to be big leaks, and then be able to schedule an act and make repairs as needed. This allows us to extend the life of our pipes significantly by doing this." noted Scott.

Once activated, the acoustic sensors collect data about the pipeline section which is being monitored. At assigned times, the information is uploaded to a secure server where advanced algorithms interpret the data, search for leak signals and generate reports. A customized information interface is created for the utility which can be integrated into existing client software programs. In the event of a leak, notification alerts can be sent to a mobile device.



New pipeline monitoring technology combined with wireless communications and data visualization as demonstrated in the NIST Global City Teams Challenge are enabling utilities to ensure sustainability of their water system.

State-of-the-art Communication Networks

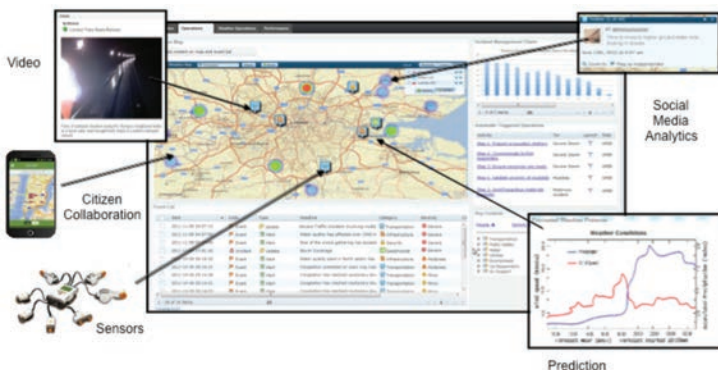
The NIST water sustainability project incorporates AT&T wireless connectivity to collect, transmit and manage data from the EchoShore®-TX monitoring nodes. AT&T cellular wireless connectivity was selected as it's secure, readily available and low cost for connecting Industrial Internet of Things like the sensor used in the EchoShore-TX system. AT&T is also helping Cities mobilize their worlds with state-of the-art communications for Industrial Internet of Things solutions like, smart metering, LED lighting, fleet management, renewable, energy and prepay energy.

Improving Operational Efficiency

IBM provides smart water management solutions using existing and new sources of data in combination with analytical, visualization and reporting tools to create an analytics-based platform called a Water Management Center. Using aggregated water/wastewater data in combination with analytical tools, and utility operating experience, the Water Management Center stimulates the creation of new insights that can improve operational efficiencies, enabling utilities to become proactive, predictive and prescriptive.

The combination of IBM's Water Management Center and Mueller Water Products' Echoshore-TX leak detection technology demonstrates how the combination of Big Data analytics and water industry innovation can facilitate and improve city response to avoid water loss in a piping network.

IBM Water Management Center



To demonstrate smarter water management in the Global City Teams Challenge, IBM's Water Management Center first uses "situational awareness" based on existing, near real time SCADA readings and GIS data to determine where the EchoShore-TX leak detection technology can be deployed in a city water transmission and distribution system. Next, the WMC ingests outputs from the EchoShore-TX platform and coordinates the creation of work orders in the maintenance management system to proactively resolve the problem.

Advancing Innovative Water Technologies

The acoustic leak detection solution which has been implemented by the LVVWD is quickly evolving into a new generation technology that is embedded directly into existing fire hydrants – creating intelligent assets that not only provide water for emergency situations but listen for leaks in small diameter water pipelines. This advanced acoustic technology combined with wireless connectivity and visualization solutions is enabling utilities to identify leaks sooner to reduce water loss, extend pipe asset life and gain operation field efficiencies.

Conclusion

Aging water infrastructure challenges will continue to escalate as buried pipelines throughout the nation near the end of their useful life, resulting in water loss, inefficient use of energy and property damage. Simply replacing or allowing these assets to run to failure is cost-prohibitive and not a sustainable infrastructure management approach. New pipeline monitoring technology combined with wireless communications and data visualization as demonstrated in the NIST Global City Teams Challenge are enabling utilities to cost-effectively gather more data to make more informed decisions that extend asset life and reduce operating risks.

"This technology allows us to be proactive," Scott said. "It saves the Valley Water by detecting those leaks and being able to fix them before they go on for potentially years unnoticed. It puts us on the cutting edge of leak detection technology in the world. It furthers our program for large diameter leak detection that we've been doing now for about the last 5 years. It really gives us some capabilities that we could not do with our portable system. And ultimately, once we are done monitoring the Strip we could take the same equipment and move it to some other pipelines. We could also find some other pipelines that have similar high-risk profiles and apply this technology to them."



Supporting Technology Adoption

The Nevada Center of Excellence (NvCOE) in Water aims to make Nevada a global water innovation hub and portal for investment by leveraging the state's leadership and expertise in water. As a public-private partnership, the NvCOE provides water management agencies, large water users, and the water technology companies that serve them a broad range of both technical and business development services to support innovation in the water market. Going forward, the NvCOE will play a coordinating role in the partnership between Echologics, the Las Vegas Valley Water District and other partners to highlight the success of the demonstration project to support the adoption of such innovative technologies more broadly across the U.S. and international water markets.

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AT&T

att.com

<http://youratt.com/smartgrid/>

Echologics

echologics.com

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ibm.com

<http://www.ibm.com/green/water>

Las Vegas Valley Water District

lvvwd.com

Mueller Water Products

muellerwaterproducts.com

The Nevada Center of Excellence / Desert Research Institute

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