HOW UTILITIES CAN EFFECTIVELY MANAGE WATER MAIN BREAK CHALLENGES

Providing excellent customer service by
using a location-based water outage solution

Water Outage Solution for Utilities

Water utilities can do little to mitigate water leak problems if they don't know where or why leaks are happening. Therefore, many are modernizing their systems with leak detection, leak prediction, and asset management capabilities. All these systems rely on location data about the infrastructure's environment, operations system performance, and maintenance activities.

A geographic information system (GIS) manages water system data. More than a record management system, GIS transforms operational data into vital information for reducing water service disruptions caused by broken mains and pipe replacement projects. Water utilities use GIS to coordinate fieldwork, monitor operating systems, communicate with customers, and make decisions that are based on water system intelligence.

This e-book describes how water companies are gaining field operations efficiencies, making better decisions by having real-time situational awareness of incidents, and improving customer satisfaction by using Esri's Water Outage solution. The solution brings together geospatial technology apps that manage and access water network asset data. Esri's mapping and analytics platform provides web and mobile apps that improve the workflow between the field and office for faster response and improved customer service. Integrated systems notify customers about planned and unplanned water shutoffs. All staff connect to the water service enterprise through a shared information system to see the company's data in its geographic context. This helps staff across the utility perform their jobs efficiently and make better decisions.

Water Outage Solution
- Complete location-based solution
- Collection of apps to support water outage workflows
- Impact analysis of planned and unplanned outages

The Burden of Aging Infrastructure

Reporting on the United States' water infrastructure, the American Society of Civil Engineers (ASCE) estimated that the nation incurs 240,000 water main breaks each year, wasting two trillion gallons of treated drinking water. Even more daunting is the fact that the rate of main breaks has increased by 27 percent in the last six years, according to a study done by Utah State University in 2018. For many utilities, whether small or large, main breaks also bring negative press that stresses the utility and frustrates customers. Communities cannot afford the costs of water loss nor can they afford massive pipe replacement programs. They can, however, invest in technologies that reduce loss, improve efficiency, and keep customers informed.

Water utilities modernize their systems to provide healthy, affordable water, yet they struggle with water infrastructure built in the last century. ASCE cites aging infrastructure as the primary cause of water main breaks. Many of the nation's water pipes were laid between the beginning and the middle of the last century. On the East Coast, water services for the Washington, DC, area reported that parts of its system have been in operation since 1928. On the West Coast,

the water provider for Los Angeles estimates that 20 percent of its one million feet of pipeline is at least a century old.

Pipes installed before 1980 are made of cast iron, a material that is brittle and cannot expand and contract with changing weather. When pipes begin to corrode and weaken, they become more susceptible to breaks.

Climate also contributes to leaks. Summertime increases water demand, which builds pressure from inside pipes. Meanwhile, heat dries the soil, causing it to shrink away from pipes. This leaves space on the outside of pipes for the inside pressure to burst through. Conversely, built-up pressure in frozen pipes ruptures water mains. The situation becomes direr as leaks lower water pressure at the tap, which makes drinking water susceptible to bacteria and E. coli. Ground swelling around underground pipes puts stress on pipelines, causing them to leak. Also, corrosive soils eat away at pipes and fittings.

Fortunately, geospatial technologies are a lifeline to water companies working to keep pace with the challenges of failing pipe systems.

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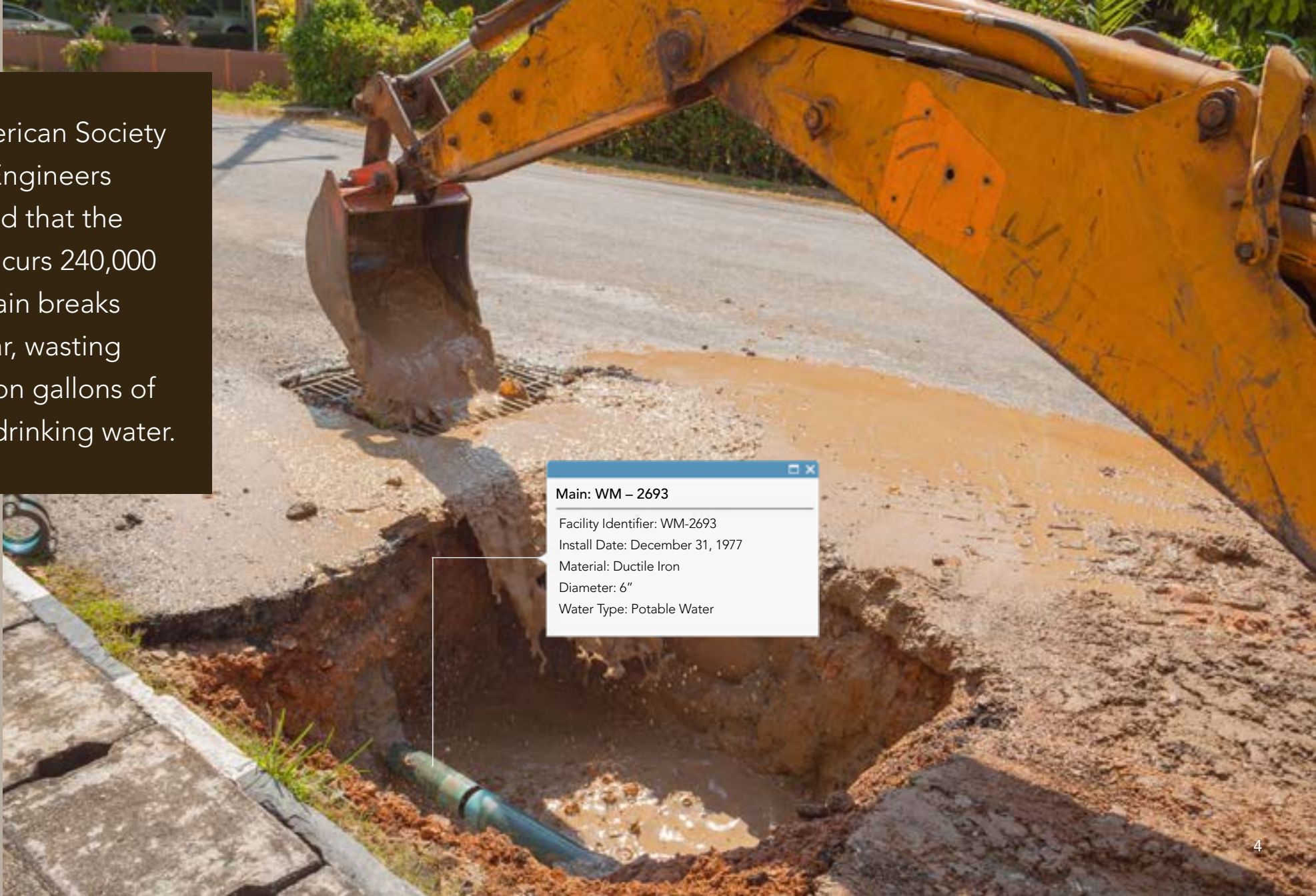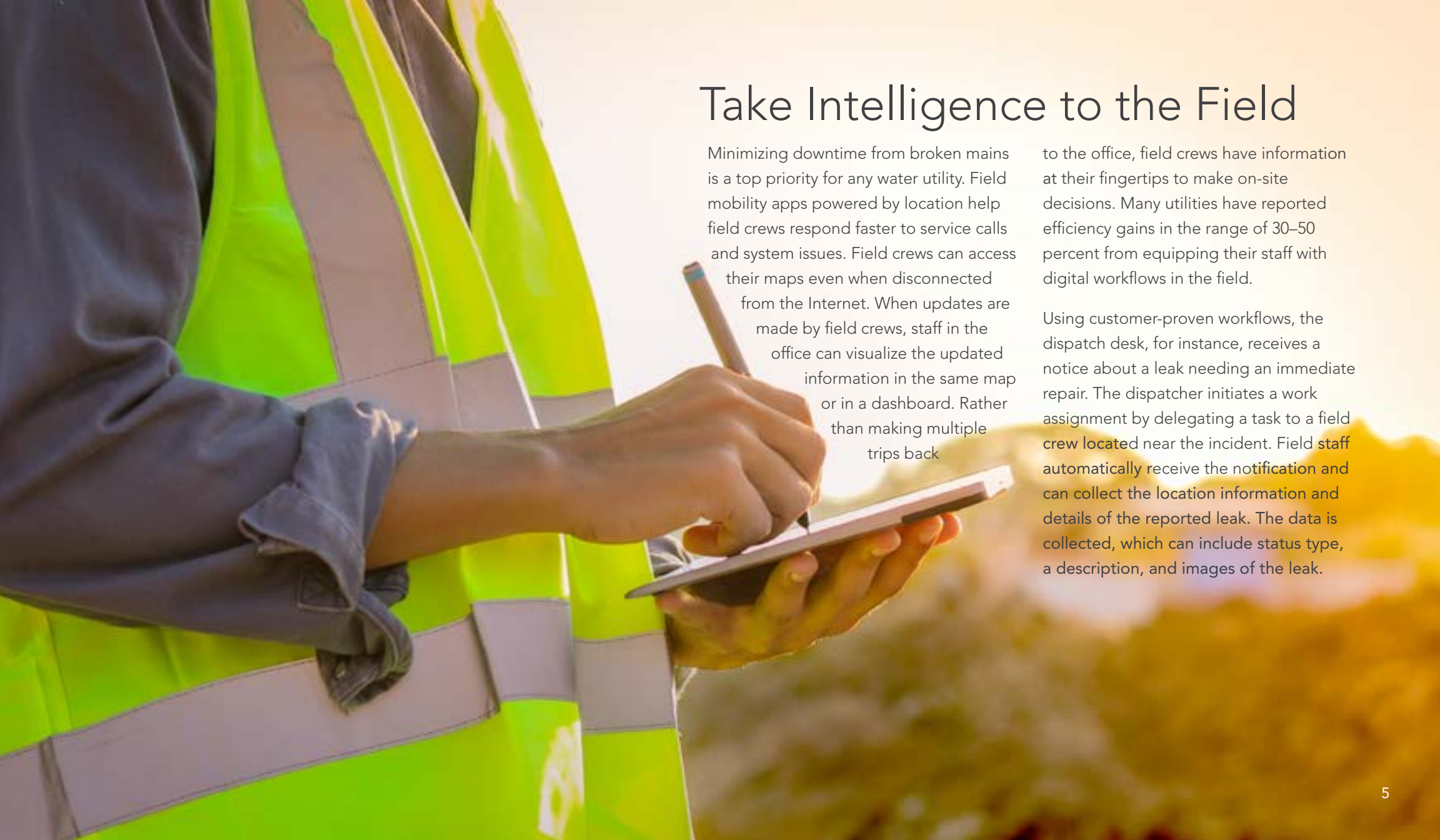
Main: WM – 2693

Facility Identifier: WM-2693
Install Date: December 31, 1977
Material: Ductile Iron
Diameter: 6"
Water Type: Potable Water

Take Intelligence to the Field

Minimizing downtime from broken mains is a top priority for any water utility. Field mobility apps powered by location help field crews respond faster to service calls and system issues. Field crews can access their maps even when disconnected from the Internet. When updates are made by field crews, staff in the office can visualize the updated information in the same map or in a dashboard. Rather than making multiple trips back to the office, field crews have information at their fingertips to make on-site decisions. Many utilities have reported efficiency gains in the range of 30–50 percent from equipping their staff with digital workflows in the field.

Using customer-proven workflows, the dispatch desk, for instance, receives a notice about a leak needing an immediate repair. The dispatcher initiates a work assignment by delegating a task to a field crew located near the incident. Field staff automatically receive the notification and can collect the location information and details of the reported leak. The data is collected, which can include status type, a description, and images of the leak.

Leak Valve Isolation Transforms Field Efficiencies

Office or field staff can view the leak data and run a valve isolation trace. Tracing the network will determine which valves will need to be shut off to isolate the leaking main, which hydrants will be out of service, and which customers will be without water. Staff can quickly see the results and perform the isolation. If there are problems finding or closing valves, staff can click on that problem valve and rerun the trace. Once the isolation is complete, the information can be shared to other maps that communicate the critical information to other staff and customers. All this is done in a matter of minutes. By using Esri's Water Outage solution, a large utility in the Southwest expects to cut the response time for shutting down the proper main by half. With over 5,000 main breaks that require a shutdown each year, this will save thousands of dollars in staff and equipment costs.
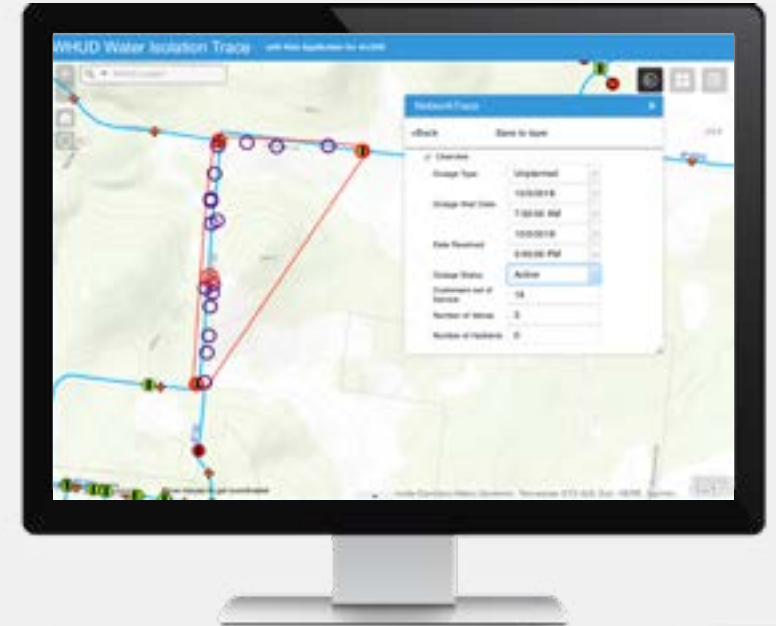
App Highlights

- Analysis of valve isolation is done in one click.
- Authoritative data is shared consistently throughout other maps.
- Relevant critical information is pushed to public-facing maps.

White House Utility District Saves 750 Hours in Labor Annually

In 2015, during its transformation to become GIS-centric, White House Utility District (WHUD) recognized the need to implement a system that would allow the district to more quickly and efficiently communicate with staff and customers who were affected by water outages—planned or unplanned. Until that point, WHUD had relied on a cumbersome, manual process that used static datasets and was not connected to GIS. Field technicians had to determine which valves needed to be closed to isolate the break and then call managers and notify them of the outage. Outage information was written on a whiteboard in the customer service area. No one was able to spatially view the outage. The process was time intensive and delayed the start

of the repair. Customers and, in many instances, employees were left thirsting for information.

By using Esri's Water Outage solution, WHUD has been able to streamline the outage notification process and immediately begin communication with employees and customers during an outage.

The Water Outage solution cut the field crews' time in half by replacing manual valve isolation and employee or customer notifications with automated processes. By automating isolation and notification, field crews quickly get to the site, begin the repair, and restore water service. According to WHUD estimates, the district saved over 750 hours in labor in 2018.

WHUD Labor Savings

- Reduced calls and wait time
- Decreased field inspection hours by 50 percent
- Saved 750 hours in labor in 2018 alone

"The Utility Isolation Trace application has been a game changer for us and our customers. It's allowed our field personnel to shut water off in a much more efficient manner, as well as notify everyone involved and impacted, in a fraction of the time it previously took. This lets our field staff start repairing the break sooner and get water restored faster."

—Avery Reecer,
Operations Manager, WHUD

Monitor Operations

Water operations managers want to know the progress of main breaks. A precise knowledge of the network improves productivity at all levels in the organization. To increase operational awareness, a dashboard provides a real-time view of what is occurring in the district such as planned or unplanned outages, active leaks, leaks summary, customer service calls, the number of customers without service, or any open requests.

The Water Outage solution provides managers with the insight they need for monitoring main break events and being able to quickly communicate the progress to other key staff in the utility. It integrates layers of real-time data and displays it as charts, graphs, and maps. Staff in the field and the office have a common view of field operation activities and system performance. From any location, they can contribute to the operations dashboard to show the most current information. The dashboard filters data so that staff can monitor specific activities such as the number of reported and validated leaks, the status of all outages, planned and unplanned events, and how many customers are without service.

App Highlights
- Common view to help everyone understand key performance indicators
- Real-time status of planned or unplanned outages
- Ability to monitor, track, and assess critical factors for making strategic and tactical decisions

Keep Customers Informed

Better service, transparency of information, and opportunities for customers to be involved can help to meet and exceed customer expectations. Providing fast response when main breaks occur and keeping customers informed can help increase customer satisfaction. Utilities must be proactive in providing accurate information that answers customers' questions. The Water Outage solution gives customer service representatives the confidence they need to provide up-to-date information to their customers. The system informs customers of where, when, and how long water outages will occur.

Customers can also access a public-facing map from a utility's website and, by entering their location, can see information about water service outages in their area. This reduces call volumes as well as wait, talk, and issue-resolution times. Customers are confident when they see that the utility is at work managing planned or unplanned outages to keep their water healthy and flowing.

App Highlights

- Easier access to up-to-date information
- More timely notifications about water outages
- Helpful call center conversations

Wessex Water Delivers Outage Information to Customers in Real Time

With 2.7 million customers across southwest England, Wessex Water continually strives to enhance the effectiveness and value of its external communications. Through a public-facing map, it now provides up-to-date information about planned and unplanned outages that are taking place throughout the region. In the customer call center, Wessex Water has used the operations dashboard to improve communications by providing an up-to-the-minute graphical overview of incidents on huge, wall-mounted smart screens. The dashboard is also available via the organization's intranet, so in the event of an emergency, it is possible to make this real-time operational information available to managers on any Internet-connected device. The new web map allows Wessex Water to keep customers better informed about current maintenance activities. The map receives over 800 hits a month and is popular with customers, who can use it to quickly find the information they need without having to make a phone call.
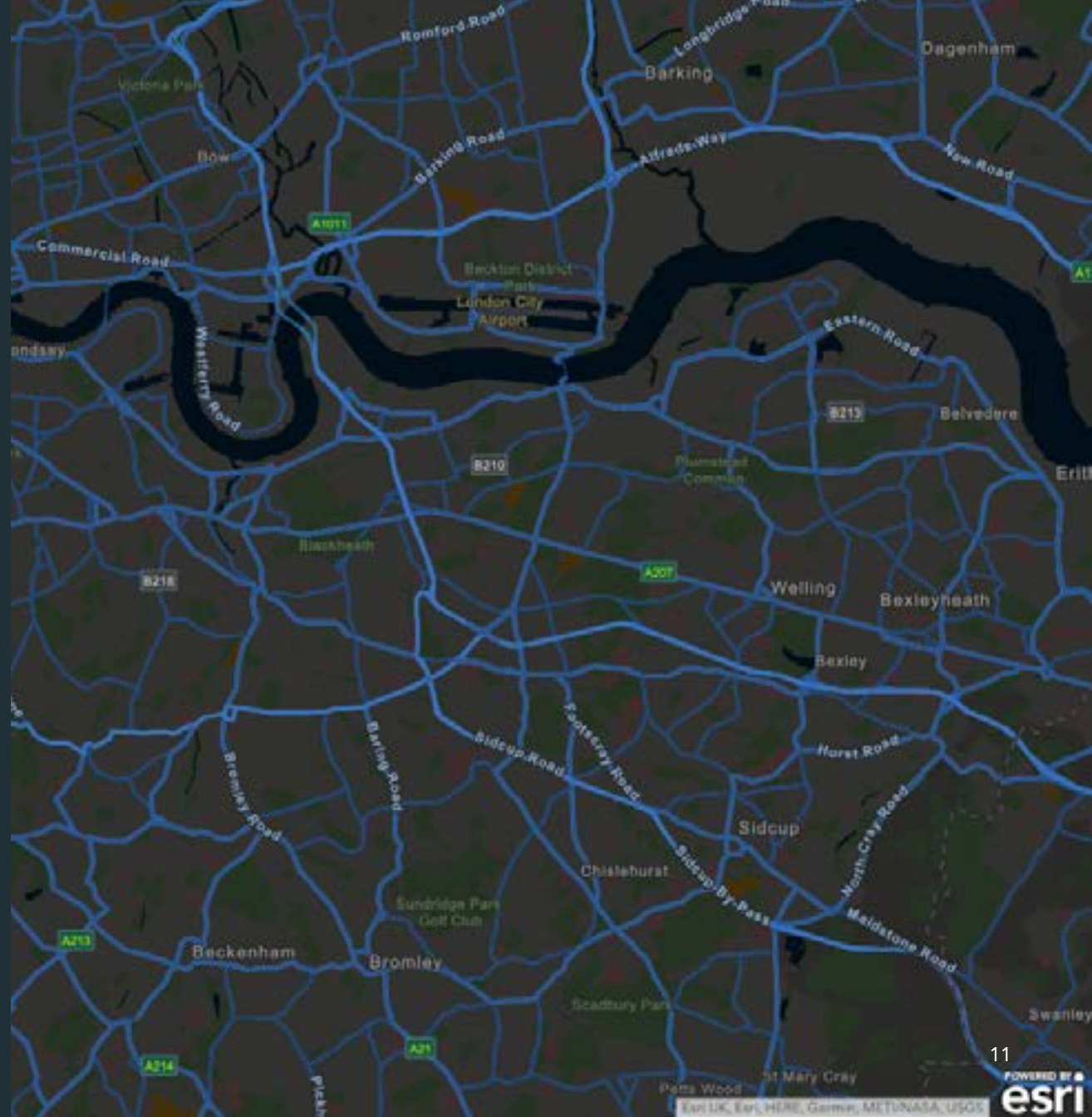
"The ArcGIS software-based interactive map supports our customer service vision by making it as easy as possible for customers to interact with us via the communication channel of their choice."

—Ryan Davis,
Customer Experience Manager, Wessex Water

Planned Outages

In addition to helping crews respond to emergency main breaks, the Water Outage solution provides tremendous value in supporting planned outages. Smaller water utilities have reported 30–60 planned shutdowns a year, whereas larger ones manage hundreds. Engineers can research and plan where outages will occur, evaluate various shutdown scenarios, determine how long their planned shutdown will take, and identify who needs to be notified.

"Using the outage solution, we can save up to four or five hours per shutdown by quickly evaluating our scenarios, not having to research customer information for notification, and properly executing the shutdown and startup activities."

—Pat Harrel, District Engineer,
White House Utility District

Sammamish Plateau Water and Sewer District Seamlessly Monitors Planned Outages

Prior to implementing the Water Outage solution, Sammamish Plateau Water (SPW) in Washington used paper maps to facilitate planned water shutdowns. All planned shutdowns begin with a shutdown meeting that involves the engineering, operations, field service, and customer service departments. Prior to the meeting, the engineer or project manager would create a paper map identifying the location of the shutdown, the valves to close to perform the shutdown, and the number of customers affected. After the meeting, staff from each of the departments would conduct further research to validate the meeting results and better understand their responsibilities for the shutdown.

Since implementing the Water Outage solution, engineers have been able to better plan for their meetings and reduce the need for postmeeting research. Engineers have the information necessary for planning and field verification of valves, meters, hydrants, and customers. Operations and field services staff use an internal outage viewer to field verify the valves and meters. Customer service uses the customer list to send out shutdown notifications.

Customers can see the outage area on a map through the public outage viewer and know how long to expect the shutdown to last. Additionally, engineers can update outage information through the outage editor without having to request the data from their GIS department. Finally, the district informs the local fire departments of out-of-service hydrants through a hydrant outage map.

"This solution provides efficiencies to all departments affected, due to the accessibility of the data—both in the office and field—and mapping abilities."

—Kyle Wong,
Engineering Manager, SPW

Reduction in Water Loss Can Save Utilities Thousands

In addition to the efficiency gains, decision-making benefits, and improvements in customer service, there are other advantages of reducing water loss that should not be overlooked. Aside from the social responsibility of conserving water, the cost savings are important to consider. For White House Utility District, the savings realized by shutting the system down faster have been calculated at approximately $25,000 per year. For utilities with more breaks, bigger breaks, and a higher production cost, this savings could amount to significantly more. In regions like California, where droughts severely stress water supplies and utilities must purchase additional water from another agency, water costs are much higher.

It's difficult to estimate the reduction in damages from main breaks; however, these damages are known to be severe. For example, University of California, Los Angeles (UCLA), claimed $13 million in damages from the Los Angeles Department of Water and Power [LADWP] when a water main break occurred on the campus in 2014. Most damages from water outages result in flooding, and the damages to infrastructure are caused by flowing water. Stopping the flow of water stops the damage. If the UCLA event could have been shut down twice as fast, millions of dollars might have been saved.

Lastly, the Water Outage solution reduces the reliance on institutional knowledge. Digital workflows are significantly reducing the amount of time it takes for new employees to learn how to operate the system. Without having data at the fingertips of staff, it can take years of on-the-job training for water operations staff to more productively manage system shutdowns. With the Water Outage solution, that time can be reduced substantially.

Summary

Efficient Field Operations

Manage and coordinate outage field activities. Efficiently schedule field crews and manage field assignments with greater confidence. As the field crew provides updates, outage information is shared with internal staff and the public. Analyze the impact of the outage at your fingertips and communicate it in a matter of minutes.

Real-Time View of Operations

Effectively manage planned and unplanned outages. A common view helps everyone understand key performance indicators to see what is working and what needs attention. Monitor, track, and assess critical factors for strategic and tactical decisions.

Improved Customer Communication

Build customer trust and increase satisfaction by providing information about water outage events to your customers in a way that is easy for them to access and understand. Customer service representatives will be empowered to share real-time field updates for better collaboration.
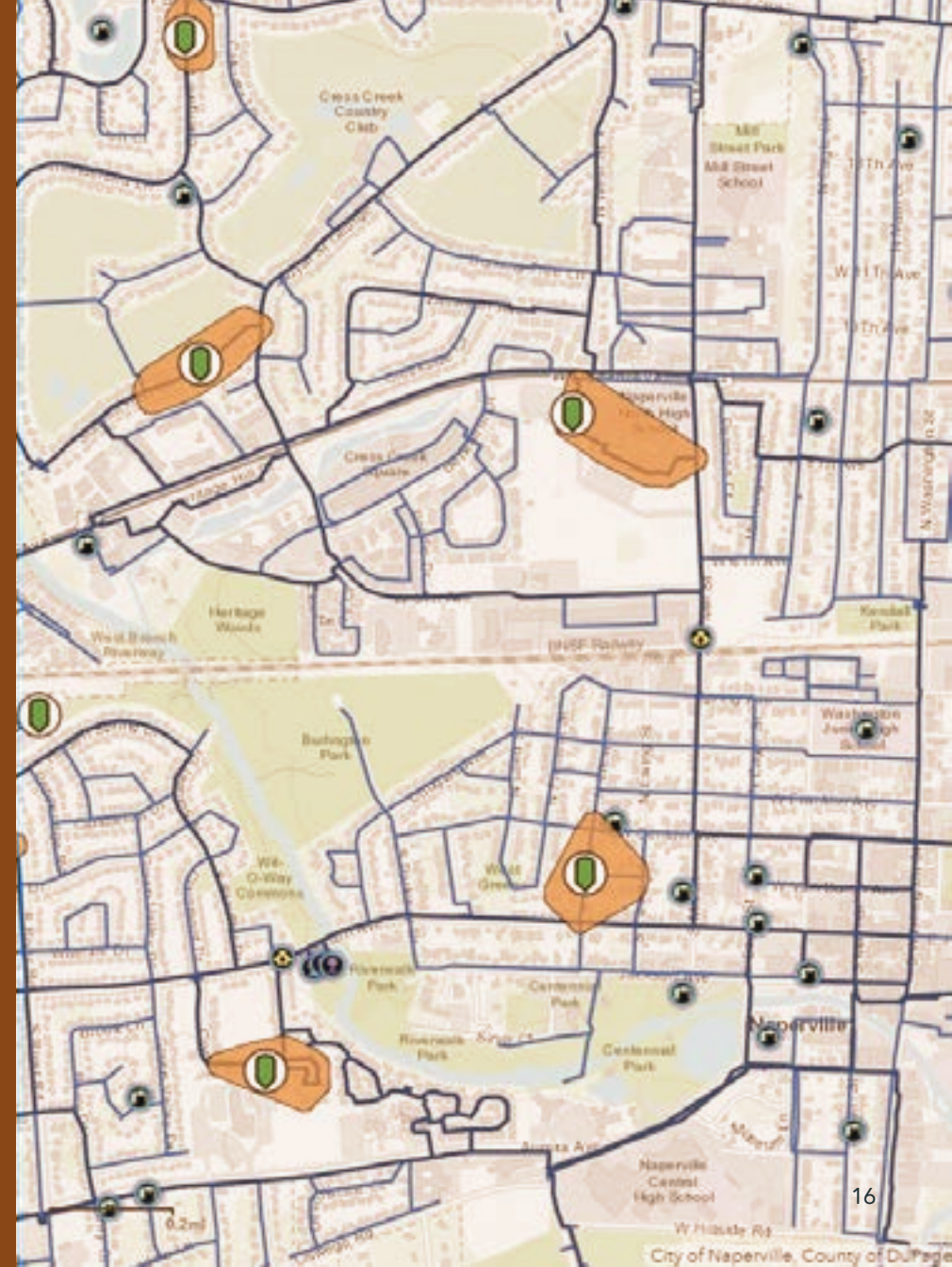
About Esri

Esri, the global market leader in geographic information system (GIS) software, offers the most powerful mapping and spatial analytics technology available.

Since 1969, Esri has helped customers unlock the full potential of data to improve operational and business results. Today, Esri software is deployed in more than 350,000 organizations including the world's largest cities, most national governments, 75 percent of Fortune 500 companies, and more than 7,000 colleges and universities. Esri engineers the most advanced solutions for digital transformation, the Internet of Things (IoT), and location analytics to inform the most authoritative maps in the world.

Learn more at *go.esri.com/water-outage*.

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