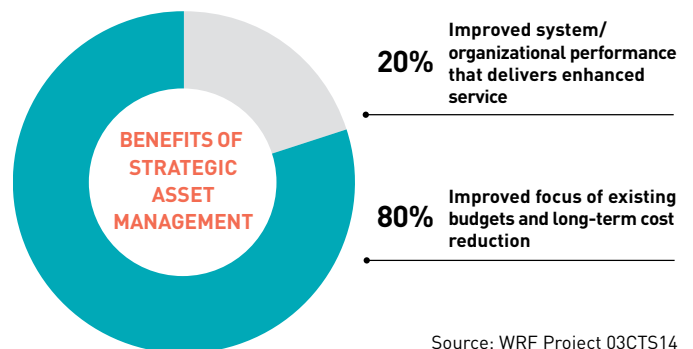# Asset Management

THE CHALLENGE

High-quality water service depends on having the infra-structure to meet the requirements of customers, utilities, and regulators. Because water services are asset intensive, utilities are constantly working to maintain these pipes, pumps, tanks, and systems, while also controlling costs and reducing risks. With deteriorating infrastructure, limited budgets, restricted flexibility in rates, and increasing expectations, utilities are on a continual quest for the most appropriate practices to meet these competing demands.

Asset management is a way of thinking—of seeing the infrastructure world from an asset-centered perspective as opposed to operations centered, and it depends on the entire organization. It allows utilities to direct limited resources to where they are most needed, and it is the basis for both short- and long-term investment planning and rate setting—as well as for building public support for these decisions. Customers need to understand what utilities do and the value of these services—and acknowledging that these investments play a critical role in their community. Additionally, asset management can help utilities advance intergovernmental relations by improving relationships, which leads to better decision making, better pricing and asset valuation, and improved technical, managerial, and financial capacity.

Every decision a utility makes is an investment decision. Effectively managing water infrastructure means answering the question: Is it the right work and the right investment at

BENEFITS OF STRATEGIC ASSET MANAGEMENT

20% Improved system/ organizational performance that delivers enhanced service

80% Improved focus of existing budgets and long-term cost reduction

Source: WRF Project 03CTS14

the right time and for the right reason? The more utilities understand about their assets—the demand, the condition and remaining useful life, the risk and consequence of failure, the feasible renewal options (repair, refurbish, replace), and the cost of these options—the higher the confidence there is in investment decisions.

THE RESEARCH

WRF has built a solid foundation of asset management research, providing the water sector with more than 300 projects that have resulted in leading practices, tools, and knowledge. This research is based on a "one water" approach to asset management, looking at a unified collection of water systems that have traditionally been divided along service lines—including wastewater, drinking water, recycled water, and stormwater. In 2002, WRF took one of the first steps toward a more integrated approach to asset management by hosting a workshop to examine the broad spectrum of asset management programs in use across the

water sector. The event brought together international experts to identify the research and tools the industry needs to thrive—and set the course for a more comprehensive asset management research program going forward.

Although maintaining and rehabilitating water system assets has been an element of WRF's research for over 50 years, in 2006 WRF responded to the industry's call for more guidance and decision support tools to help implement these programs, and launched the Strategic Asset Management (SAM) Program. The program works to address the need for useful products to support planning, acquiring, operating, maintaining, rehabilitating, and building water infrastructure to maximize performance while minimizing the life-cycle cost at an acceptable level of risk.

Because asset management has far-reaching implications—with estimates to renew and replace infrastructure totaling more than $300 billion over the coming decades—WRF works strategically with other organizations to ensure the best possible solutions. This includes a multi-year effort with EPA that began in 2010, to improve the operation, maintenance, management, and replacement of water and wastewater systems. As part of EPA's Aging Water Infrastructure Research Program, WRF received $6.5M in funding to evaluate new technologies and techniques to help utilities cope with aging and failing sewer lines, water mains,
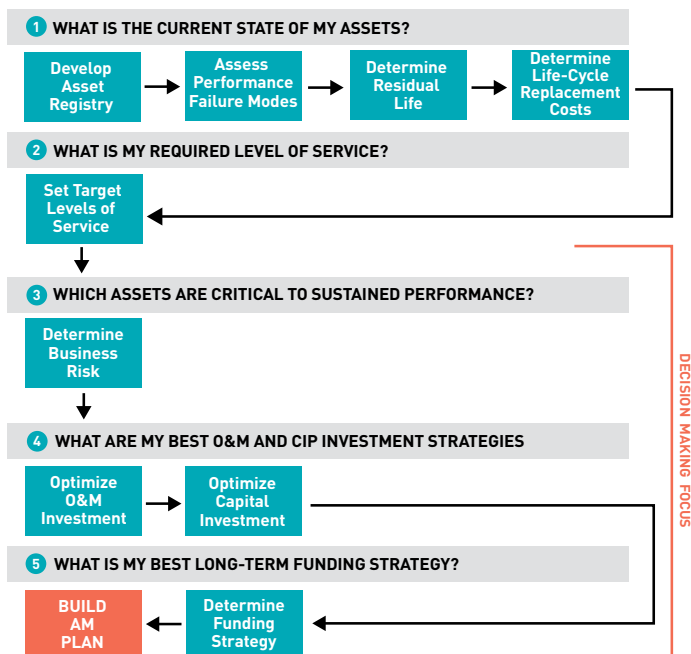
and other components. The collaboration resulted in more than 20 projects including the groundbreaking WATERiD knowledge base—an information center where utilities can share information on pipeline condition assessment and renewal technologies, techniques, and practices.

Strategic Asset Management
Asset management is a collection of processes and practices, and the right combination can make the difference between consistent, reliable water service and system failures. WRF has been leading the way in cutting-edge tools to help utilities make strategic decisions about what to do and when to do it.

Because asset management best practices are systematic applications of business-like decisions and processes under a well-thought-out strategy for achieving outcomes, WRF's research is centered around five core questions and 10 key steps to effective asset management (see figure). This framework allows practitioners of all levels to design their asset management program around a set of practices with a level of sophistication tailored to their needs. These practices, are intended to assist in the systematic development of rationalized business cases for every dollar invested in a utility—from capital and administration to operations and maintenance—making every dollar work as hard as possible.

5 CORE QUESTIONS AND 10 STEPS TO EFFECTIVE ASSET MANAGEMENT

1 WHAT IS THE CURRENT STATE OF MY ASSETS?

Develop Asset Registry → Assess Performance Failure Modes → Determine Residual Life → Determine Life-Cycle Replacement Costs

2 WHAT IS MY REQUIRED LEVEL OF SERVICE?

Set Target Levels of Service

3 WHICH ASSETS ARE CRITICAL TO SUSTAINED PERFORMANCE?

Determine Business Risk

4 WHAT ARE MY BEST O&M AND CIP INVESTMENT STRATEGIES

Optimize O&M Investment → Optimize Capital Investment

5 WHAT IS MY BEST LONG-TERM FUNDING STRATEGY?

BUILD AM PLAN ← Determine Funding Strategy

DECISION MAKING FOCUS

KEY STRATEGIC ASSET MANAGEMENT PRODUCTS

SIMPLE: Sustainable Infrastructure Management Program Learning Environment (03CTS14):
An online knowledge base with more than 16,000 pages of best practices and processes from around the world, offering state-of-the-art asset management strategies, tactics, tools, and resources that correspond with each of the 10 steps of asset management.

Practitioners Guide to Economic Decision Making in Asset Management (SAM1R06b1, b2):
A two-volume guide containing approaches to economic decision making related to asset management and guidance on the use of core economic principles at each stage of asset management development.

WRF's strategic asset management research is organized in a phased, four-track effort:

Track 1: Stakeholders Communication Framework and Tools
Track 2: SAM Benchmarking and Case Studies
Track 3: Decision Support Tools and Implementation Guidance
Track 4: Prediction of Remaining Asset Life

Outputs from this research are incorporated into an online portal, the Sustainable Infrastructure Management Program Learning Environment, also known as SIMPLE. This site acts as a hub for asset management resources, offering nearly 20 tools in all. A hallmark of WRF's asset management research efforts, SIMPLE was originally released in 2009 and has grown with evolving industry needs to include intuitive, user-friendly practice guidelines, templates, and decision support tools that simplify the development of effective, enterprise-wide asset management.

Condition Assessment

Before utilities can forecast and prioritize maintenance needs—or the likelihood of failure—they must be able to assess the condition of their assets. This process can be complex, especially when it comes to underground assets that are not easily accessible. Because of the extra time, effort, and expense involved with these assessments—which can cut into resources needed for daily operations—utilities have not always been quick to adopt these processes.

WRF research is making the process easier, providing information and tools to help utilities understand the benefits and shortcomings of various piping materials, providing some of the first comprehensive reviews of everything from the traditional cast iron pipes to newer materials like high-density polyethylene and structurally enhanced PVC. This includes research on pipe deterioration that began in the 1980s, which sheds light on the little-understood physical processes involved in corrosion, as well as better ways to monitor its effects.

While options for condition assessment have been available for some time, obstacles such as lack of understanding technologies or potential benefits, have delayed adoption. WRF has taken important steps to help the water sector accept these tools and put them to use, including the 2007 release of *Condition Assessment Strategies and Protocols for Water and Wastewater Utility Assets* (03CTS20CO). The nearly

SOLUTIONS IN THE FIELD:
City of Wyoming, Michigan

In the early 2000s, the city of Wyoming faced an enviable situation: it had a relatively young water distribution system with few leaks and breaks. However, it also lacked a renewal and replacement plan for this system. Without a concrete strategy in place, the city began looking for the best path forward to safeguard the system and ensure it would continue to perform at high levels for years to come.

In 2002, they hired CH2M to inventory Wyoming's buried assets, using pipe age, size, material, and condition to target renewal priorities over the next 50 years. When it came to predicting replacement needs for various classes of pipe, CH2M turned to KANEW. The software, developed by WRF as part of the study *Quantifying Future Rehabilitation and Replacement Needs of Water Mains* (265), helps pinpoint likely water main failures over a given period.

This information helped Wyoming develop an effective asset management strategy. With a coming decade of stable, affordable investment, Wyoming had time to develop funding alternatives for its increased future needs, including selling revenue bonds to fund pipe replacement work. They also used the information to help educate customers on the needs and costs to continue delivering reliable service.

SOLUTIONS IN THE FIELD: City of Gresham, Oregon

In 2008, the city of Gresham wanted to improve the management of their assets across all sectors, which required a better understanding of future rehabilitation and replacement schedules and long-term projected costs. The city turned to WRF for assistance, and using an independent peer-review approach, they began to evaluate their ongoing asset management programs and create a roadmap for an integrated program.

WRF's Strategic Asset Management Gap Analysis Tool (SAM GAP) played a key role in guiding this process. The tool offers an online, self-assessment process that allows utilities to rapidly measure their performance against data from over 170 of the world's best asset management practitioners. Using the gap analysis results as a starting point, the team zeroed in on the key process steps (based on WRF's 10-step process) that would have the most impact on their program. Ultimately they decided to concentrate on the first six steps over a two-year period, including steps such as determining residual

lives for each asset. Based on the results, the city's Water Services Division took the lead in communicating the long-term benefits of asset management to city council. They showed how using only short-term considerations impeded the collection of information to make better long-term management decisions for the city and its infrastructure. The approach led to a new way of thinking about assets, which helped foster cross-departmental cooperation, as well as a better overall understanding of the value of asset management.

500-page guide outlines a step-by-step approach for developing a condition assessment program, including a framework for selecting assessment tools and techniques.

To further advance the science in this area, WRF launched a five-year research effort with UKWIR and several Australian utilities and universities. The research, *Advanced Condition Assessment and Failure Prediction Technologies for Optimal Management of Water Supply Pipes* (4326), which aimed to more accurately measure the physical state of pipes, beginning with cast iron water mains, led to the development of a predictive model for pipe corrosion based on a leak-before-break concept. The results make important connections between the timing of an initial fracture and an eventual burst, substantially improving failure prediction techniques, and saving the industry roughly $1 billion a year.

WHAT'S NEXT?

As the water sector works to communicate more effectively with the public about what they do, asset management will play a critical role in helping utilities explain these valuable services, as well as garner support for investment decisions. Although considerable progress has been made in asset management research, fundamental challenges still remain, such as changing requirements and the ability to use data in new ways to enhance decision making. Along with research to address the recent shift toward data-driven asset management, additional work is required to determine the remaining useful lives of assets, risk management, maintenance, service levels and costs, communications, and data management. WRF will continue to invest in these key areas, as well as integrate crucial Intelligent Water Systems research, in order to provide substantial value to the entire water sector.