

Digital Twins in the Water Sector

ENABLING SMARTER INFRASTRUCTURE DECISIONS FOR OPTIMIZED
MANAGEMENT OF WET INFRASTRUCTURE UTILITIES



Data and Through the Years...



Traditional Mainframes



Bulky Desktops



Small CPU's, Mobile Devices, IOT, Cloud



Cloud Services



The Reality: Technology and Innovation in Government



- Often Lags Compared to Other Business Sectors
 - Oil/Natural Gas
 - Manufacturing
- Lags Due to:
 - “Tried and true” nature of engineers and planners
 - Municipal “Red Tape”
 - Skepticism/Nervousness regarding Adoption of New Technology

Challenges water/wastewater utilities face

Understand, manage, and mitigate risks (including asset failure, flooding, overflows)

Respond to change – new tech, regulations, climate, COVID, political change

Manage complex, fragmented information – from assets, sensors, rain gauges, and models. Capitalize on the same, up-to-date information

Maintain service levels at minimum cost, by optimizing processes and use of your assets

Capture valuable institutional knowledge to support operational decision-making

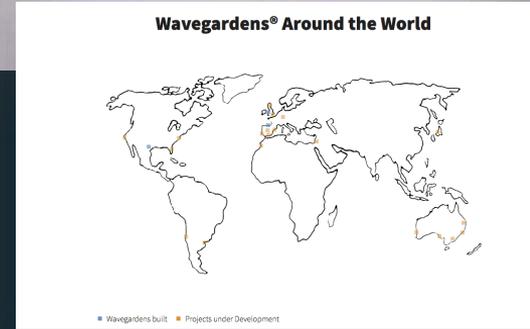
Meet targets that are increasingly visible (e.g. financial, environmental pollution etc) & be able to report on and defend decisions

What is a digital twin? Why it's a game changer?

- “A digital twin is a virtual representation of an object or system that spans its lifecycle, is updated from real-time data, and uses simulation, machine learning and reasoning to help decision-making.”

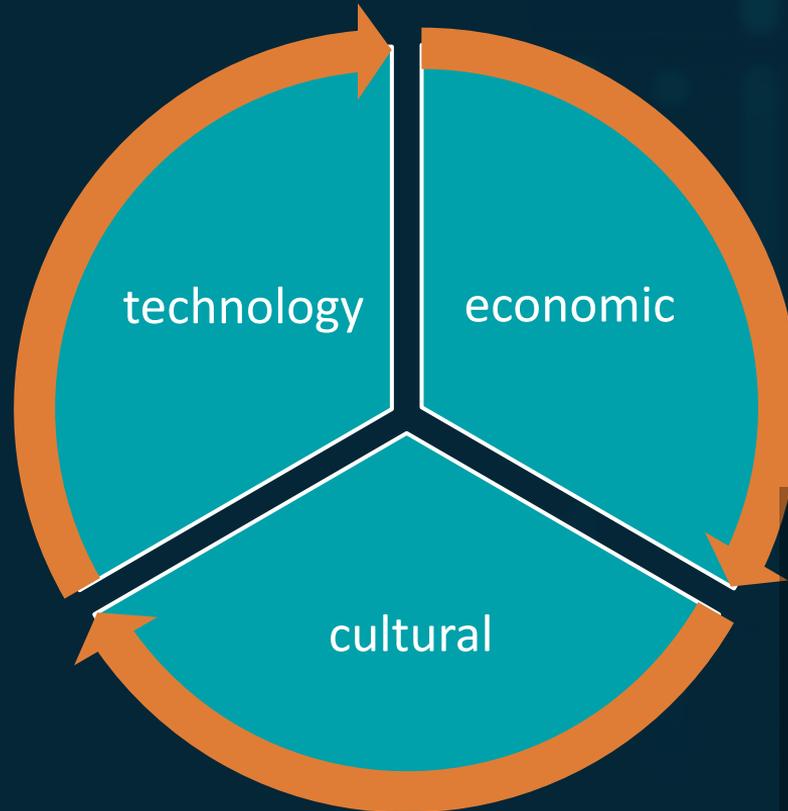
VALUE PROPOSITIONS

- Predictive maintenance
- Process optimization
- Energy & GHG reduction
- System integration
- Remote troubleshooting
- What-if scenario analysis



Digital Twin strategy is important now because it lies at the convergence of technology, economics, and culture in our industry

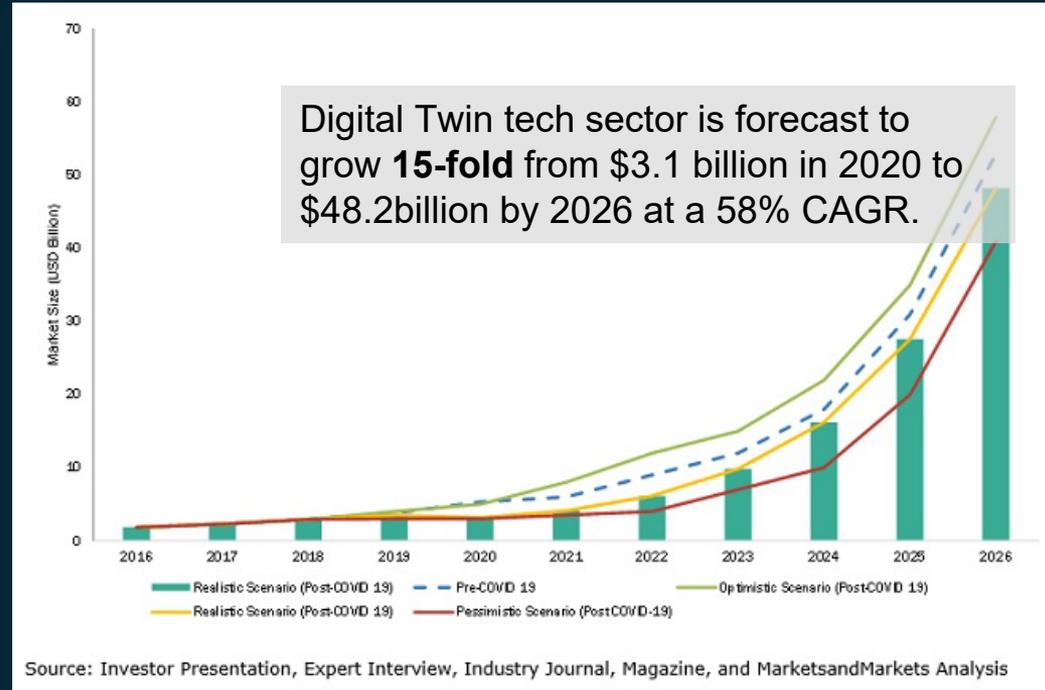
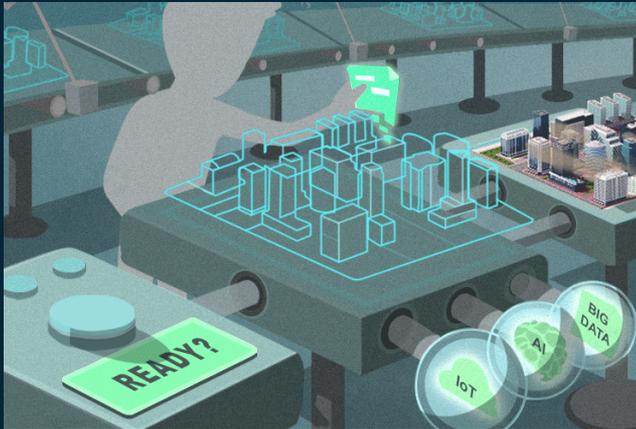
- Increasing number of data points from sensors
- Availability of affordable computing resources (software, hardware, sensors, and means to capture and transmit the data)
- Growing interoperability across applications and platforms
- AI/Machine learning is rapidly growing and adding value to digital twins



- ABI Research (2021) suggests that digital twins can save city planners and building owners \$280bn over coming years
- A solid fit with the US government's Build Back Better drive and \$1.2trn infrastructure bill.
- Reduce project costs and schedules by up to 30% in design, logistics, and large capital projects

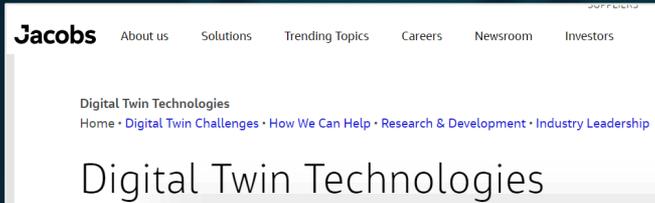
- Pandemic forced our clients to accelerate steps towards digital
- Mindset to be more energy and carbon efficient
- Addressing resiliency is a stakeholder expectation
- Working smarter with less resources (retiring workforce, shrinking budgets)

The concept of digital twins is between discovery and adoption. Gartner estimates the concept should reach widespread adoption within the next five to 10 years



Digital Twins from Different Angles

Consulting Firms



Jacobs About us Solutions Trending Topics Careers Newsroom Investors

Digital Twin Technologies
Home • Digital Twin Challenges • How We Can Help • Research & Development • Industry Leadership

Digital Twin Technologies



Stantec markets • services • locations • ideas • about • careers • investors • global | eng •

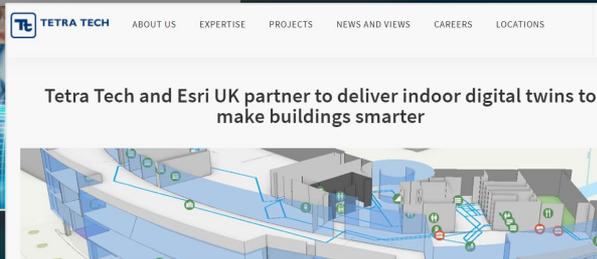
Get to know the digital twin

The next gamechanger for digital design and buildings.



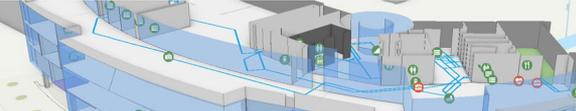
ARCADIS

How digital twin technology is critical to the future of the engineering and construction industry

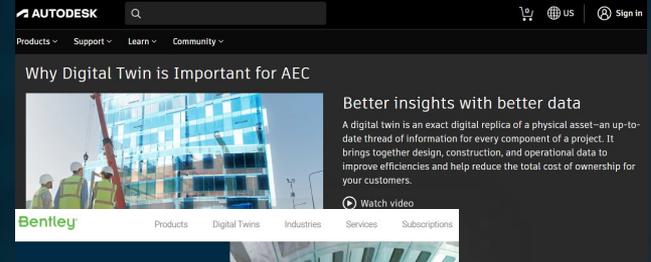


TETRA TECH ABOUT US EXPERTISE PROJECTS NEWS AND VIEWS CAREERS LOCATIONS

Tetra Tech and Esri UK partner to deliver indoor digital twins to make buildings smarter



Technology Companies



AUTODESK

Products Support Learn Community

Why Digital Twin is Important for AEC

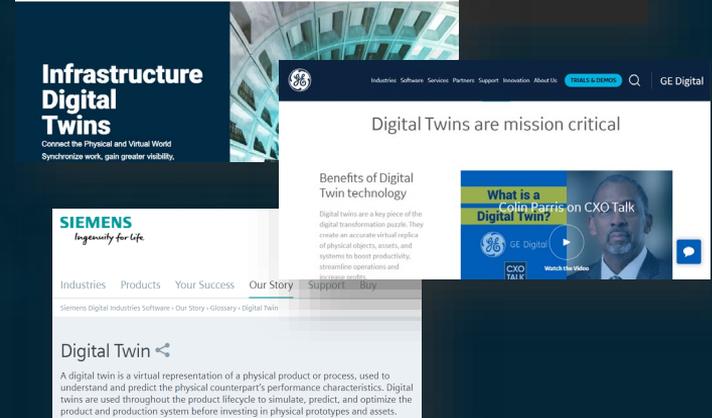


Better insights with better data

A digital twin is an exact digital replica of a physical asset—an up-to-date thread of information for every component of a project. It brings together design, construction, and operational data to improve efficiencies and help reduce the total cost of ownership for your customers.

Watch video

Bentley Products Digital Twins Industries Services Subscriptions



Infrastructure Digital Twins

Connect the Physical and Virtual World
Synchronize work, gain greater visibility.

Digital Twins are mission critical

Benefits of Digital Twin technology

Digital twins are a key piece of the digital transformation puzzle. They create an accurate virtual replica of physical objects, assets, and systems to boost productivity, streamline operations and improve safety.



What is a Digital Twin?
CEO Talk
Watch the Video

Siemens Digital Industries Software • Our Story • Glossary • Digital Twin

Digital Twin

A digital twin is a virtual representation of a physical product or process, used to understand and predict the physical counterpart's performance characteristics. Digital twins are used throughout the product lifecycle to simulate, predict, and optimize the product and production system before investing in physical prototypes and assets.

Digital Twins are Fueled by Innovation

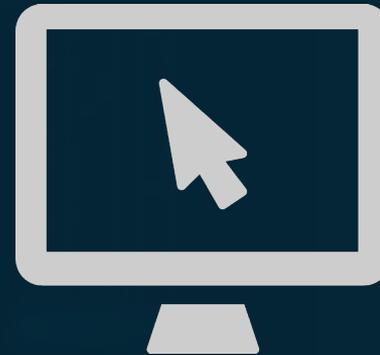


Innovation drives us to provide creative client-driven solutions using emerging technologies



Digital Know-How

Innovation drives us to launch digital products that are high-value to our clients and are forward-thinking



Digital Products

There are 10 organizations accelerating their digital twin strategy



Doosan Creates Digital Twin of Wind Farm

With Azure digital twins, IoT Hub, and Bentley iTwin digital visualization, Doosan takes advantage of ready-to-use building blocks to quickly build the wind farm model, and now use it to create new technical innovations and business opportunities.

Parametric and 3D Design Helped a Drought-Plagued Megacity Explore its Water Future

Between 2014 and 2015, the worst drought in a century affected every aspect of Brazilian livelihood – from coffee production to critical infrastructure and water services. What if we showed you how Jacobs' Replica™ digital twins solutions software helped one Brazilian megacity visualize options for a more resilient future water supply?



"Digital Twin" Modeling Guides U.S. Navy's \$21B Shipyard Plan



File image courtesy USN

REIMAGINING BRIDGE INSPECTIONS

Minnesota DOT saves 40% with digital twins using drone-gathered data.

Digital Twin and Analytics Improve Operations, Minimize Costs

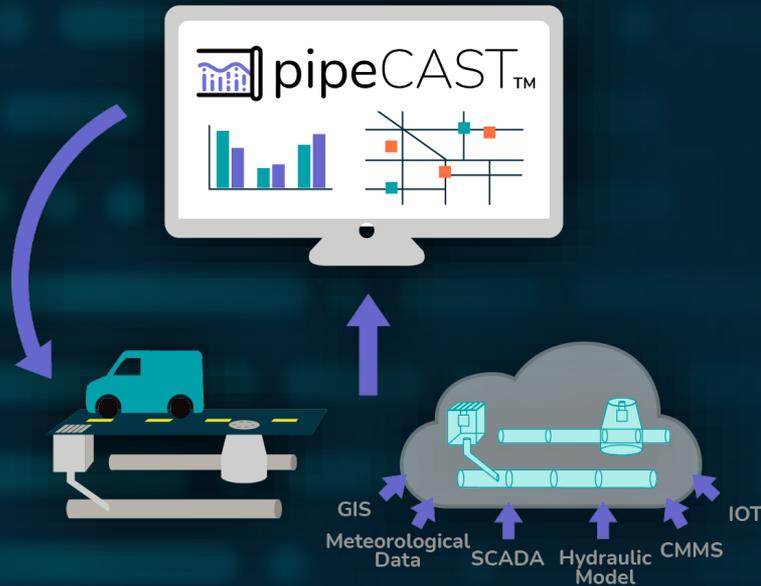
By 2020, researchers predict that companies using digital twins of IoT-connected assets will achieve gains of up to 25%. What if we showed you how a Jacobs-designed simulation platform is driving savings in the industrial water space using digital twin analytics to minimize resource usage?



Águas do Porto Makes Data-Driven Decisions with Digital Twins

The water utility improved the entire urban water cycle by commissioning a smart water management platform, H2Porto. This digital twin helps improve operational mobility and created operational gains of 23%.

Digital Twin – Innovative Approach To Real-time Analysis



- Operational Intelligence = continuous ‘real-time’ data
- Translating that intelligence through data visualization
- Provide insights on performance and problems to proactively improve the system

Tools for a More Predictable Tomorrow!

Intelligent O&M Practice



Integrate data streams with maintenance data to improve sewer system operations and management

Manage of System Exceedances



Gain insight into system to proactively prepare and respond to the next overflow event

Improved Collaboration



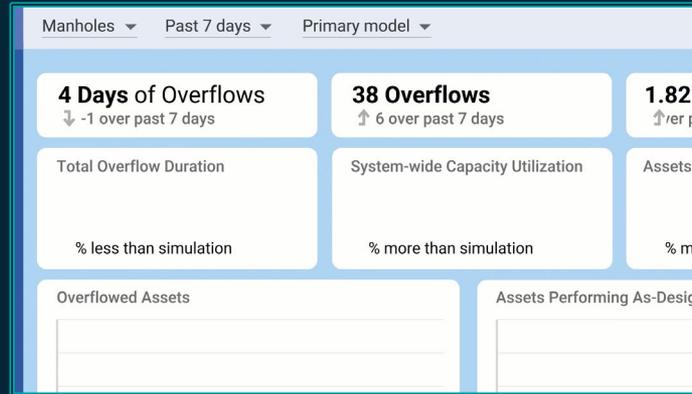
Improve collaboration between departments, breaking down silos to create a common operating picture

Building intelligent O&M – managing sewer overflows with twins



Dashboards that matter

Continuous integration with your system's models provides immediate access to sewer overflow performance information.



Sewer anomaly detection

Daily performance validation helps you identify discrepancies so you can spot problems before they arise.



Anywhere, anytime access

Secure and uninterrupted access to critical infrastructure, even in trying times.

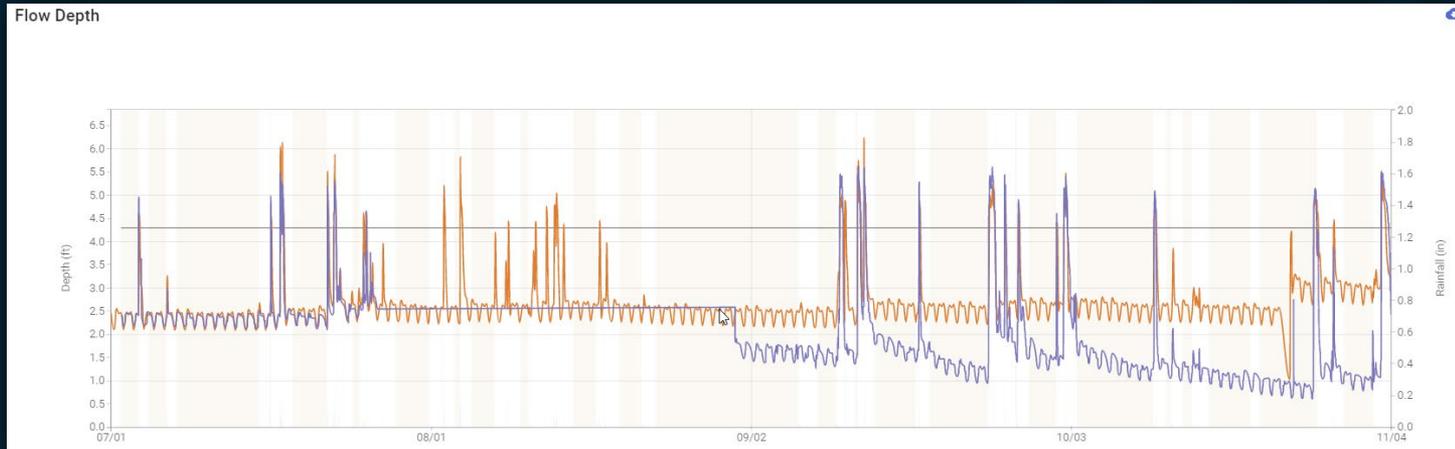


Insights into value – Identify failing assets before they get worse (or catastrophic)

- Most sewer collapses are detected after they fail or worse become catastrophic and the road collapses
- The following example identified sewer collapse before potential catastrophic conditions



Review and monitor cleaning effectiveness and how fast the debris & sediment is returning



- Captured and preserved maintenance effectiveness
- Reduced System-wide Interceptor cleaning inspection contract by 50%
- Gained confidence in targeting efforts only on assets in-need





Improving Collaboration

Improve collaboration between departments, breaking down silos, and creating a common operating picture



Lack of collaboration increases inefficiencies



Working around data silos

Inefficient, time-consuming workflows around accessing data and knowledge from other departments.



Decisions based on judgement not data

A lot of inconsistent and inefficient operations based on judgement calls.



Limited understanding

Lack of transparency and collaboration among teams.

Improved operations & collaboration



Common ops dashboard

Improved collaboration through a shared understanding of system performance.



Shared alerts & reporting

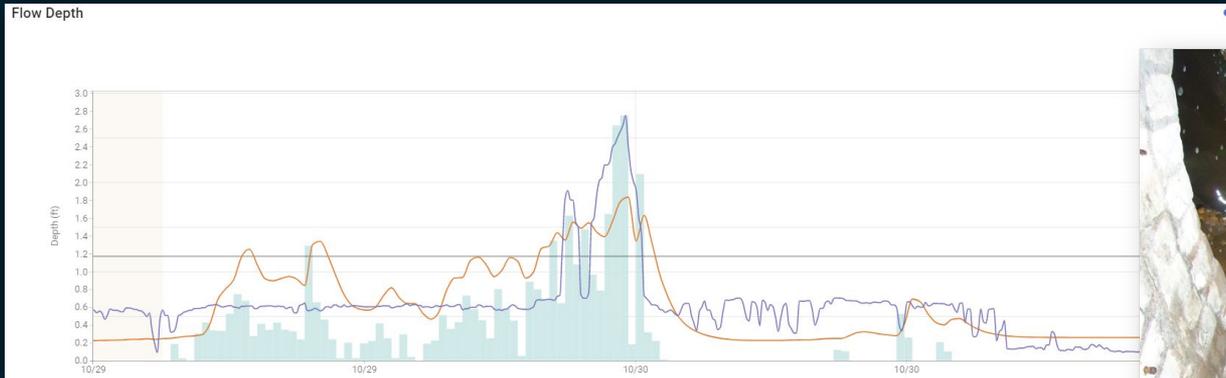
Easily share system-specific views and reports to the relevant team members.



Future-proof your teams

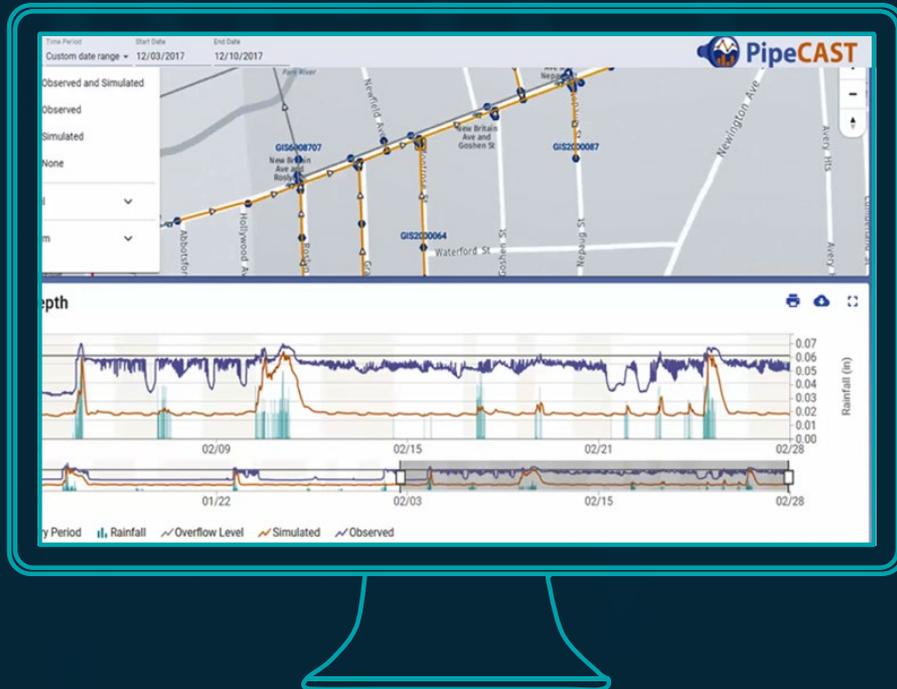
Capture institutional knowledge and facilitate collaboration across departments.

Digital Twin exposes 'hidden' problems



- Digital twin predicted overflow sooner plus a stronger response to rainfall
- Investigations found slanted, irregular weir structure
- Plus, identified sensor was positioned incorrectly

Digital Twins can enable you to optimize spend, manage risk, and adapt quickly with confidence



- **O&M Workflows.** Data-centric solution built from integrating and optimizing your O&M data
- **Data Visualization.** Role-based dashboards rich in intelligence and visualizations, conveying insights to your water and sewer systems
- **Engineering Collaboration.** Tailored insights derived from collective understanding and expertise
- **Cloud Interface.** Web-based dashboard accessible to all staff, from any device, 24-7

Conclusions

- Continue to embrace big changes in raw data management and continue to think outside the box in ways the pandemic forced you to
- Develop a data management/data sharing plan at the highest levels within your organization
- Learn from the mistakes of other industries
- Start planning now so you can reap the benefits of digital twin technology as your organization progresses



Look forward, position now, and reap the benefits of using digital twins to redefine how utilities operate



THANKS!

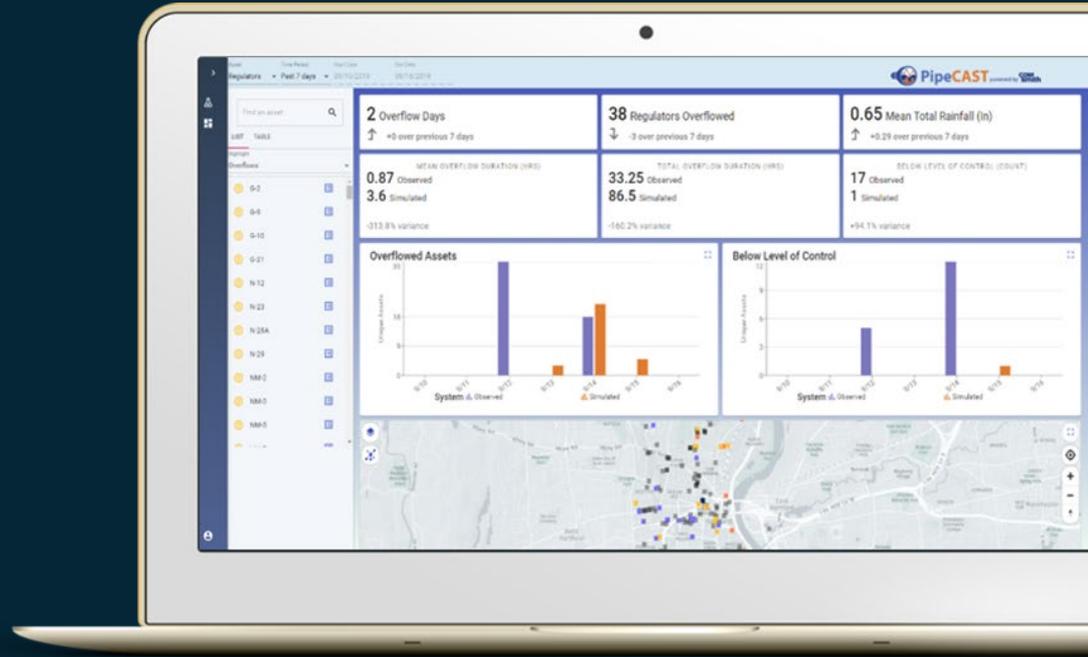
Do you have any questions?

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CAPTURE



ASSESS



SIMULATE



TAKE ACTION

