LIFT/RMWEA Intelligent Water Systems Webcast Series – Day 1

LIFT
Leaders Innovation Forum for Technology

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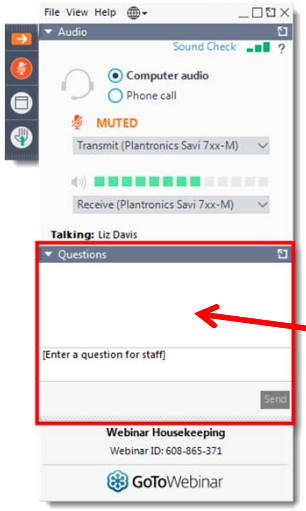
How to Participate Today

- This webcast will be recorded and available afterwards
- PDH instructions will be sent to all attendees 24 hours after the webcast has ended



Audio Modes

- Listen using Mic & Speakers
- Or, select "Use Telephone" and dial the conference (please remember long distance phone charges apply).

Submit your questions using the Questions pane.

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Webcast and Workshop Organizers

Webcast and Workshop Chairs

Abigail Antolovich, Denver Water
Tanja Rauch-Williams, Carollo Engineers

Steering Committee Members

Ben Standford - Hazen and Sawyer
Charles Bott - HRSD
Jim McQuarrie - Metro Wastewater Reclamation District
Fidan Karimova, Aaron Fisher, Christobel Ferguson - LIFT
Morgan Brown, Barry Liner, Lisa MacFadden – WEF
Walter Graf, David Morroni, Stephanie Fevig, Frank Blaha, Mary Smith - WRF
Erica Bailey - City of Raleigh

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Today's Presentations

- Intelligent Water Systems – State of the Industry, **Christobel Ferguson and Walter Graf, WRF; Lisa McFadden, WEF**
- Enabling Teams to Adopt Intelligent Water Systems at Utilities: Leveraging Front-Line Employees to Develop Solutions for Employees and Customers, **Ryan Ural, American Water**
- How One Utility Introduced AMI into Distribution Systems and Is Leading the Way on COVID-19 Detection in Collection Systems/AMI in water distribution systems, **Pablo Calabuig, GO-Aigua**
- Predictive Modeling in Collection Systems & Complimentary Benefits, **Luis Montestruque, EmNet; OJ McFoy, Buffalo Sewer Authority**
- Advanced Asset Management: Applying Asset Management Principles and Examining the changing asset management landscape, **Phill Segura, Denver Water; Celine Hyer, ARCADIS**

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A joint initiative of:
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Vision

The water sector embraces innovation to support healthy, sustainable communities.

Mission

LIFT supports the efficient evaluation, demonstration, and deployment of innovative technologies and practices by providing a forum for collaboration among water sector partners.

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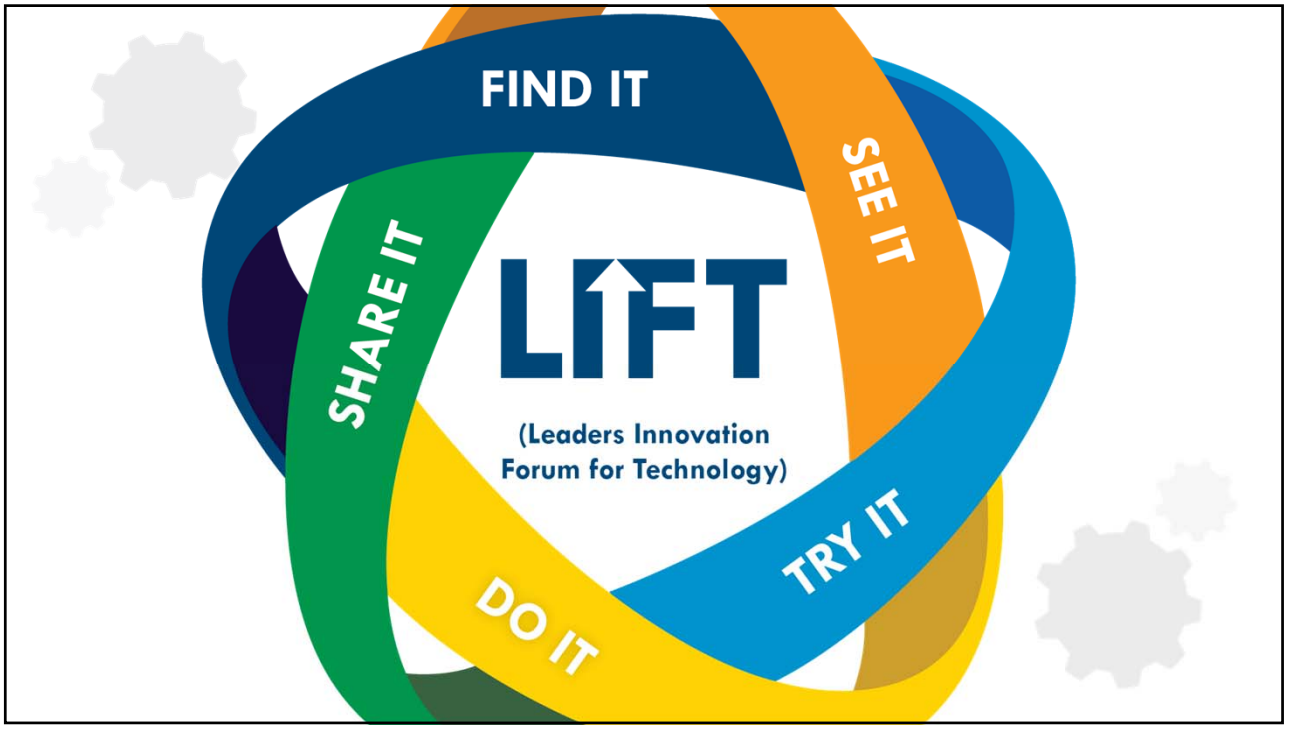

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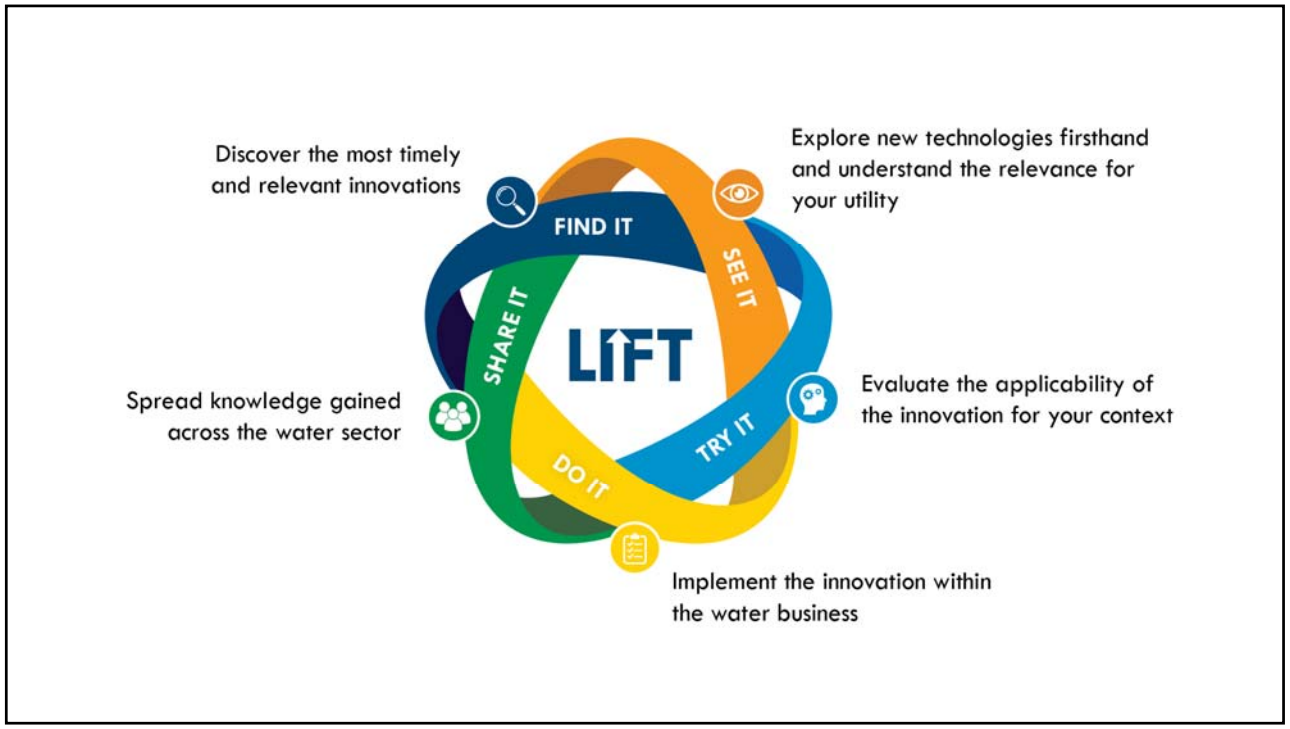

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LIFT Tech Trends Tool

Is a visualization tool that identifies trends in the deployment of innovative technologies across the water sector, including wastewater, stormwater, drinking water, desalination, and water reuse facilities.

This survey is open and we want to hear from you about your plans, to get your insight into the future of water innovation. As information is collected, the tool will be periodically updated throughout the year.

This survey is for utilities only.

http://sgiz.mobi/s3/LIFT-Technology-Survey-2019

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WRF LIFT Team

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LIFT Focus Group - IWS

- Chaired by Ting Lu
- WRF & LIFT staff support
  - Walter Graf
  - Fidan Karimova
- LIFT Intelligent Water Systems group explores new technologies and management strategies that will be part of the digital utility of the future

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Intelligent Water Systems Research at WRF – An Overview

LIFT/RMWEA Intelligent Water Systems Conference

Walter Graf

Asset Management and Intelligent Water Systems

June 17, 2020

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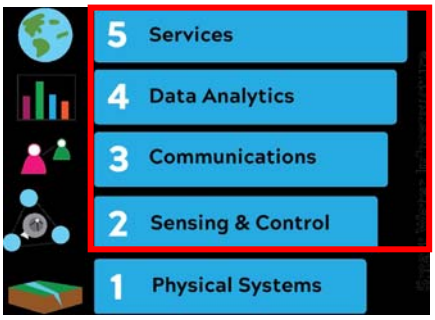
WRF Intelligent Water Systems Research

The collection of data-driven components helping to operate the data-less physical layer of pipes, pumps, reservoirs and valves. IWS improve the efficiency, longevity, and reliability of the underlying physical water network by better measuring, collecting, analyzing, and acting upon a wide range of network events.

New strategies and tactics:

- Can reduce service disruptions from asset failures,
- Give new insights on performance lead to reduced costs.
- Help the water sector move towards becoming smarter/intelligent demonstrating IWS is a core capability and
- Demonstrate how relevant aspects of Big Data/IoT and advanced analytics will be the backbone of the digital utility.



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Definition of Data-driven Utility - How to be Digital Utility and the Framework for an Intelligent Water System (#5039)

- Define basics of data driven utility – different factors to consider on the road to becoming an IWS.
- Develop a framework for the fundamental elements necessary for an IWS to assist utilities to become a Smart Utility at their own pace and ability.
- Include business case, planning and change management guidance along with how and where to begin because IWS is a journey, not an "all or nothing" effort.
- Identify the pieces and how they fit together; front-end planning to avoid ad hoc application of smart water technologies.
- Based on successful application of Intelligent Water Systems (IWS) approaches, define concepts and components of an effective data-driven, digital utility/smart water system, including culture, management and skill sets.
- Develop Best Appropriate Practices relevant to each part of the framework.

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Designing a Sensor Network in an Urban Sewershed (#4797)

- Consolidate the results of the two Phase I projects ("Leveraging Other Industries-Big Data Management" (SENG7R16) and "Designing Sensor Networks and Locations on an Urban Sewershed Scale" (SENG6R16) into a combined demonstration project.
- Conduct demonstration projects at multiple utilities to assess the effectiveness of sensor-based, real-time monitoring/metering and models/decision support systems on sewershed/sub-sewershed scales, including the application of analytics to solve sewershed network management issues.
- Automation of Quality Assessment and Quality Control (QAQC) checks for data
- Data Use Mapping and Database Management - develop and test methodologies to assist utilities with planning for existing and future data management needs
- Create methodologies and frameworks to assist with the development of sensor-based networks and data management systems that incorporate new and emerging monitoring/metering/analysis technologies which can be used to assess historical data and provide support for real-time decision-making.
- Document and summarize lessons learned during this project to assist other utilities in the future.

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Thank You!

Walter Graf – Asset Management & Intelligent Water Systems

Water Research Foundation

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2020-21 LIFT Intelligent Water Systems Challenge

INTERESTED IN PARTICIPATING?
View Challenge information at
https://www.waterrf.org/intelligent-water-systems-challenge

SUBMISSION	DATE
TEAM REGISTRATION	09-APR-2021
CHALLENGE PLAN	14-MAY-2021
CHALLENGE SOLUTION	13-AUG-2021
WINNER ANNOUNCED	18-OCT-2021 AT WEFTEC

QUESTIONS?
Please direct questions to
Lisa McFadden, WEF at lmcfadden@wef.org or Fidan Karimova, WRF at fkarimova@waterrf.org

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24-FEB-2020 Knowledge Development Forum on Intelligent Water Technology Solutions for Disinfection and Public Health Protection and Water Security

QUESTIONS TO SUBJECT MATTER EXPERTS

1. Is there sufficient confidence in existing data sets and how the data is gathered?
2. Are there challenges with the use of big data, or any data integrity issues for researchers and data scientists in employing AI and machine learning?
3. Have issues of cybersecurity and privacy hindered the implementation of new technologies?
4. Do you find that workforce issues are hindering the use of new technologies?
5. Human behavior presents a major challenge for modelers as it is difficult to predict. PPE compliance, which is crucial during outbreaks, is a good example. How can intelligent water systems help us with this challenge? How do you strike the balance between occupational health protection and "Big Brother is watching"?
6. What is needed to help utilities accelerate the rate of technology adoption?
7. What current technical gaps exist in scientific research on waterborne disease outbreak or water sector security?
8. Do policies and procedures limit the ability to implement new technologies?
9. You've decided to pursue a smart water technology, but you need to pilot it first. What are the trademarks of a robust smart water system feasibility study from a utility and a vendor's perspective?
10. Small, rural and remote water systems present a unique challenge for the water sector. Are intelligent water technologies useful for these types of systems? Where would smart water systems add value? Where would the main challenges lie?

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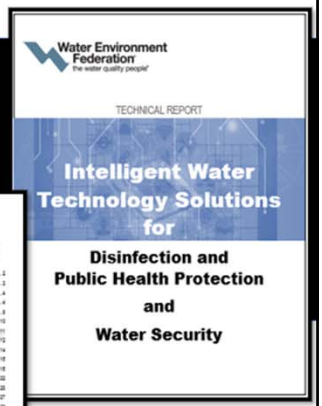
TECHNICAL REPORT: Intelligent Water Technology Solutions

+ 10 ANTICIPATED FACT SHEETS



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TECHNICAL REPORT AND FACT SHEETS WILL BE AVAILABLE AT:

ACCESSWATER.ORG

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Questions?

WEF LIFT Team

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Enabling Teams to Adopt Intelligent Water Systems at Utilities

Leveraging frontline employees to develop solutions for employees & customers

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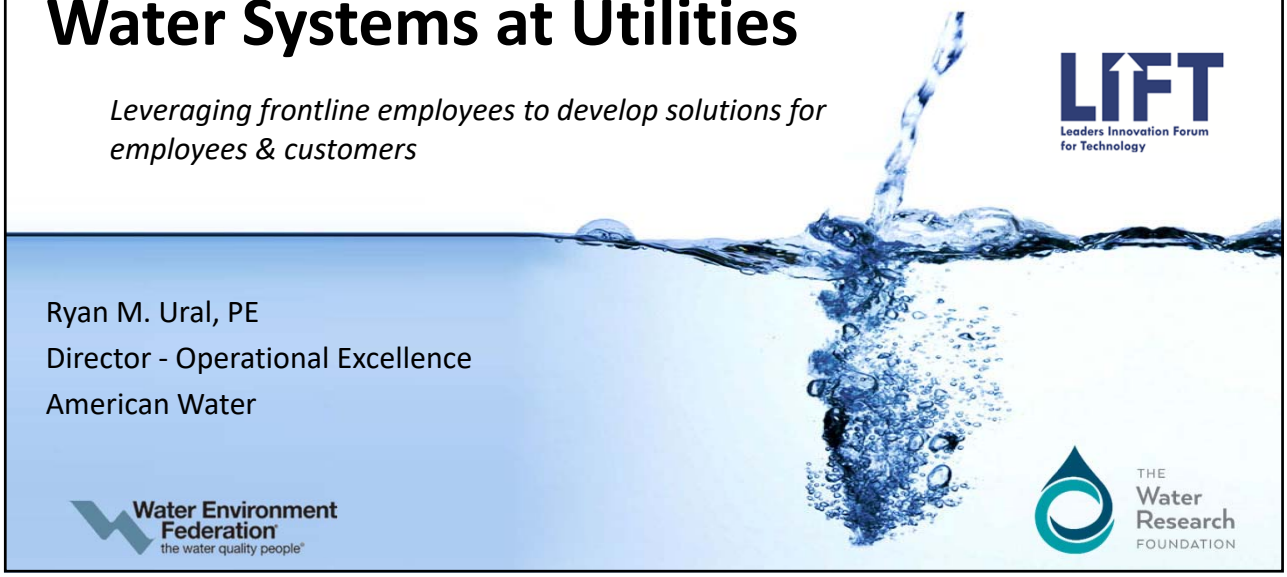

Ryan M. Ural, PE
Director - Operational Excellence
American Water

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Our Process for New Technologies

AMERICAN WATER

PLAN	DEVELOP	DEPLOY
❑ **Does the business need this? What insight are we gaining?** *VALUE > COST*	❑ **Is our data clean & structured?**	❑ **Field users on the team are:** *Product ambassadors* *Vested in the product's success*
❑ **Who will it impact?** *Internal & external*	❑ **Info for sake of info?** *Collect what is truly needed.* *Don't be a burden on the field user.*	❑ **Training & coaching** *Co-creators of the training* *In their voice* *Given by their co-workers*
❑ **How will it be used?** *Understand the field user.* *Listen to them & incorporate.*	❑ **Is workflow understood & mapped?** *End-to-end process outline.*	❑ **Is it being used properly?** *Build utilization tools into product* *Follow-up, mentor/coach*
❑ **What inter-operability is needed?** *Other departments* *Other systems*	❑ **What pain points can we eliminate and avoid creating?** *Eliminate long-time headaches, avoid making new ones.*	❑ **Continuous Improvement** *Feedback = repeat the process*
Engage & Listen	***Collaborate***	***Train & Improve***

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Some of What We've Built, Together:

CUSTOMERS
- Account Information
- Invoice & Payment History
- Customer Communications
- Appointment & Work History

SERVICE LINES & METERS
- Service & Meter Work Orders
- Appointment Scheduling
- Meter Information

OPERATIONS
- Asset Management
- Work Order Management
  - *Production*
  - *Distribution*

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Steve Gocinski

Field Service Representative: New York American Water

AMERICAN WATER

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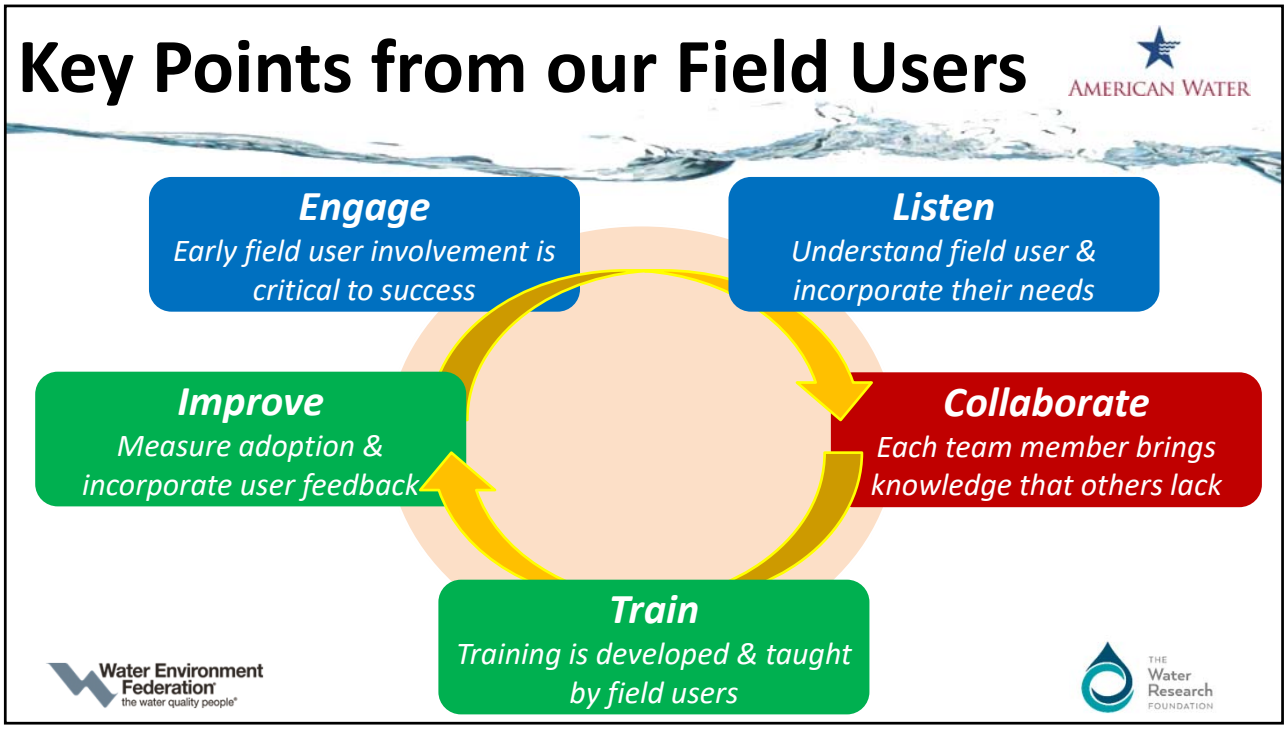
Key Points from our Field Users



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Thank You

ryan.ural@amwater.com

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Resiliency and adaptability in times of crisis

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Case example: How Digital Transformation helped Global Omnium respond to COVID-19

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About us

global omnium

+130 years — Experience in water

400 — Cities

4 million — Customers served

3,000 — Employees

go-aigua

Digital Transformation: The City of Valencia

- *1st European City with 100% AMI, with almost 1 million smart meters by 2009*
- *6 bn data points managed every year through GoAigua*
- *First (and one of the only) Operating Digital Twins worldwide*

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What motivated our Transformation

Rising cost of water treatment and increasing public concern about water scarcity

Reactive (vs. proactive) network management leading to low service level

Distributed assets and data (SCADAs, GIS, CMMS, ERP) creating huge operational siloes

Lack of connection between operating KPIs, work orders, and financial results

AMI is the future, but use cases are not 100% clear

Different manufacturers and vendors using incompatible technologies

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The journey: 3 key phases

2006/ 13

Generational gap. Global Omnium took a leap forward in the digital transformation of its **processes and infrastructure**: **large scale network sensorization plan**

2013/ 17

The crash of 2013. Large amount of data allocated in an unstructured platform. New paradigm shift: **Data Centric Platform.** Innovation culture & **GoHub**

2017+

From Data Centric to Smart Platform. Consolidation of the solutions, digital twin, and consulting value proposition. **GoAigua spin off**

go-aigua

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Having a Data-centric Platform

Early alarm & detection

Energy & sustainability

Automated Operation

Operational optimization

System perfor-mance mgmt.

What-if scenario simulations

GoAigua Big Data Platform (+6 bn data points managed / year)

SCADAs

IoT sensors

CMMS

GIS

AMI...

Principles of the platform:

- Data centric
- Independent to technology / vendors
- Modular & scalable
- Smart

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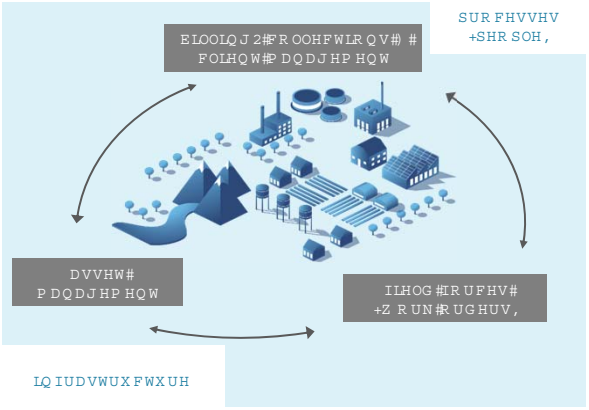
The results of the Transformation



40%
Reduced NRW

60%
Improved customer experience

15% less energy consumption & Improved Resiliency

20%
Operational efficiency

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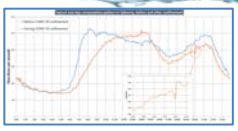
Resiliency in times of crisis (COVID19)

1. **Anticipate changes in the network** due to differences in **consumption patterns,** and **quickly react** (e.g., demand curve, cheering at 8pm, wipes)



2. In just hours, **evaluate all potential actions** and design & **execute new operations** for all **plants, pump stations**, and all **network elements** automatically

3. **Easily train** a back-up **group of network operators**

4. **Automatically reassess all emergency protocols under the new normal**

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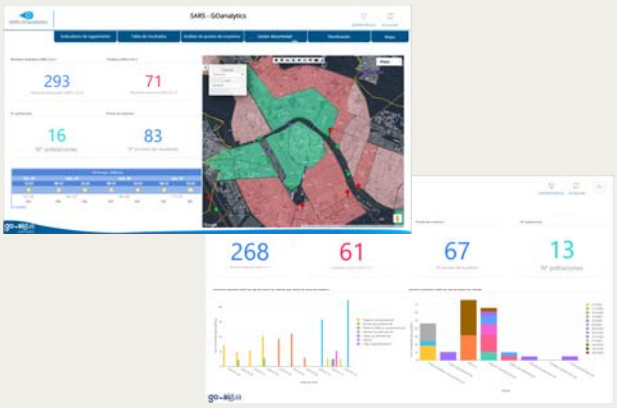
And adaptability to new needs: SARS-CoV-2 sewer surveillance system

Some history

- ***2017*** — Partnered with **Spain's Spanish National Research Council** (CSIC) to find a methodology to **detect NoV GI, NoV GII** and **HAV virus** in **sewer water**
- ***2019*** — Developed **sewer surveillance system** to support the research results
- ***2020*** — Reengaged CSIC to **adapt the system to SARS-CoV-2** (detect number of genomic units / liter)
- ***Last weeks*** — **Pro-bono collaboration with the Spanish Government to scale up the program**

Holistic surveillance program to support 'reopening'



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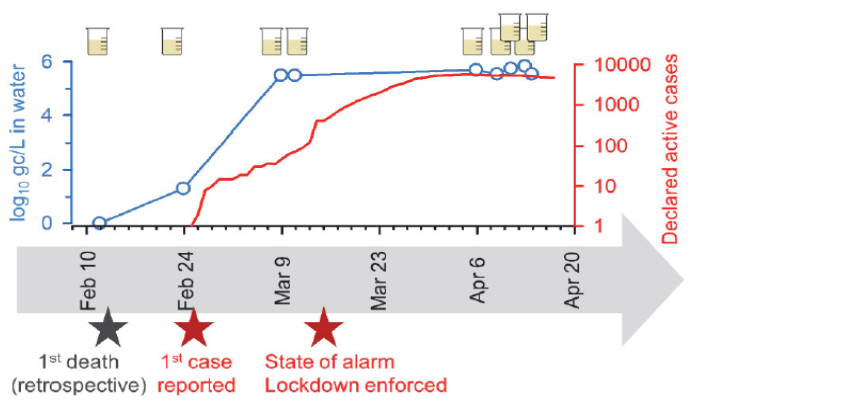
Detect early, and detect everyone

- In April 2020, the water utility of Valencia (Spain) developed the **methodology to track SARS-CoV-2 RNA in sewer water**
- Researchers of the utility and the National Agency CSIC conducted an **experiment on refrigerated samples from February** and **March**
- Results show that this methodology **could have anticipated** official cases by **10 to 15 days** in some cases



SOURCES: 'Metropolitan Wastewater Analysis for COVID-19 Epidemiological Surveillance'; Walter Randazzo, PhD; Enric Cuevas-Ferrando, MSc; Rafael Sanjuán, PhD; Pilar Domingo-Calap, PhD; Gloria Sánchez, PhD

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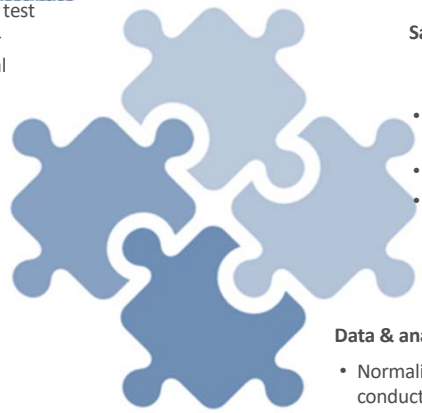
Implementation: 4 key elements

Laboratory capabilities

- Laboratory formula & methodology to test
- Optimization of processes in the water laboratory to become a microbiological "factory"

Digital integration with utility IT systems & data

- Integration of real time data & information from the rest of the utility, e.g.,
  - CIS
  - GIS
  - AMI



Sampling planning & logistics

- Optimal sampling locations & times (network topology needed to study sewersheds and flow)
- Generation of sampling plans and designation of jobs
- Monitoring of field work & lab processes

Data & analytics

- Normalization of results (e.g., dilution, pH, conductivity, SS, etc.)
- Real time monitoring of other parameters
- Behavioral patterns to detect future spread

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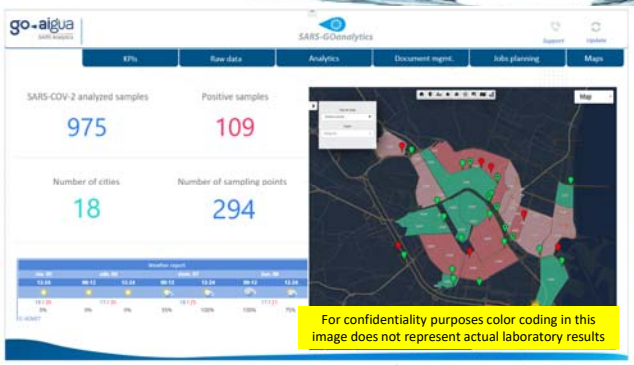
How it looks in real time



For confidentiality purposes color coding in this image does not represent actual laboratory results

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Predictive Modeling Optimization During Wet Weather

Luis Montestruque, PhD, Xylem Inc.
Oluwole (OJ) McFoy, P.E., Buffalo Sewer

LIFT/RMWEA Intelligent Water Systems Webinar
June 17, 2020

xylem
Let's Solve Water

BUFFALO
SEWER AUTHORITY

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Buffalo Sewer Collection System

- 790 out of 850 miles of sewer are combined
- **North District**
  - 6 CSOs
  - Main Receiving Water – Niagara River
- **Scajaquada District**
  - 11 CSOs
  - Main Receiving Waters – Black Rock Canal and Scajaquada Creek
- **South Central District**
  - 35 CSOs
  - Main Receiving Waters – Cazenovia Creek and Buffalo River

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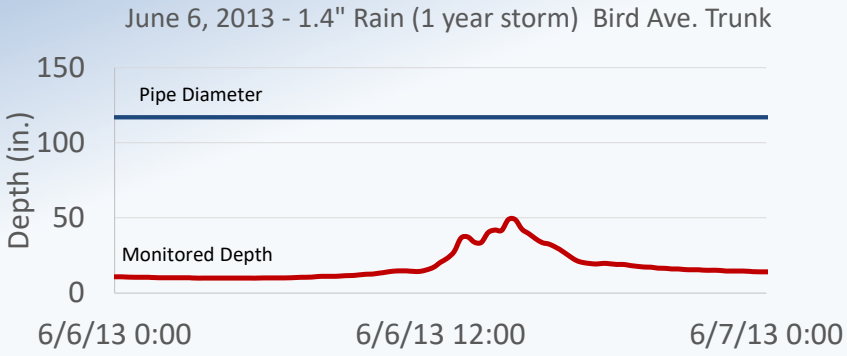
Unused Capacity in System

- 8 major trunklines were more than half empty during the peaks of the largest expected storm events



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Site Prioritization Criteria

- Reduction of the number of activations, preferably to below the compliance limit
- Reduction of the cumulative amount of overflow volume
- Reduction of overflow volume into higher priority water bodies
- Reduction of system-wide overflow volume

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Real Time Control Projects

SITE	DISTRICT	TYPE	CAPACITY
Bird Avenue	Scajaquada	In-Line Storage	1,000,000 Gal.
Lang Avenue	Scajaquada	In-Line Storage	840,000 Gal.
Smith Street	South	In- Line Storage	3,800,000 Gal.
Hazlewood Avenue	Scajaquada	In-Line Storage	1,650,000 Gal.

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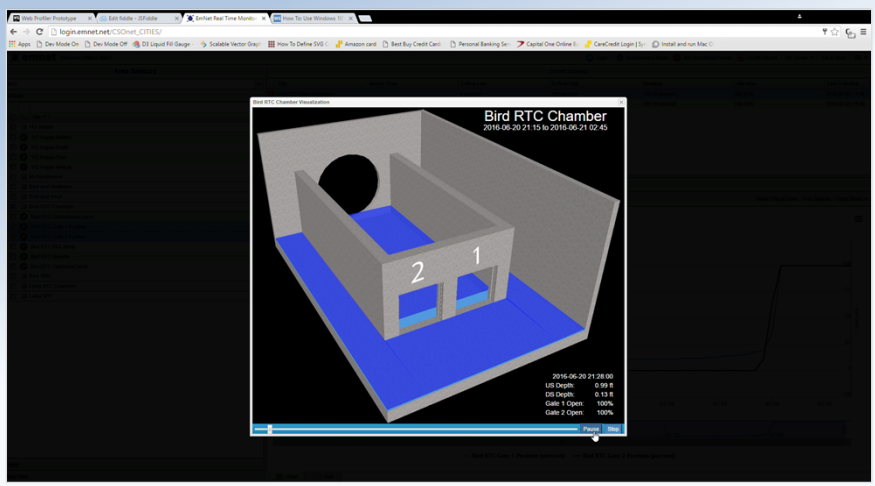
ILS Chamber Design



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Iterative Re-evaluation

- 2018: Identified and prioritized additional sites to reduce overflow volumes
- 2020: Newly calibrated model used for further site analysis
  - Including active RTC sites to determine additional potential
  - Re-evaluated previously identified RTC sites

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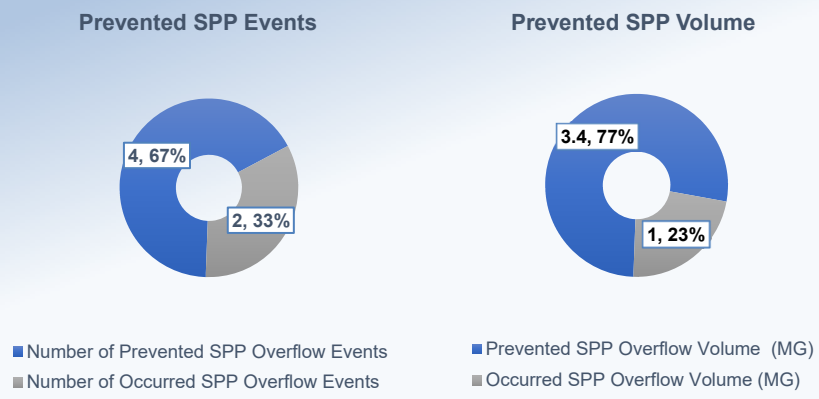
Lang Avenue 6 Month Post Construction Performance



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Coordinated Control of RTC Sites

- Sites communicate with each other to signal when wet weather is happening and find where capacity exists in the system
- Benefits
  - Utilize individual ILS sites more efficiently
  - Higher systemwide overflow volume capture

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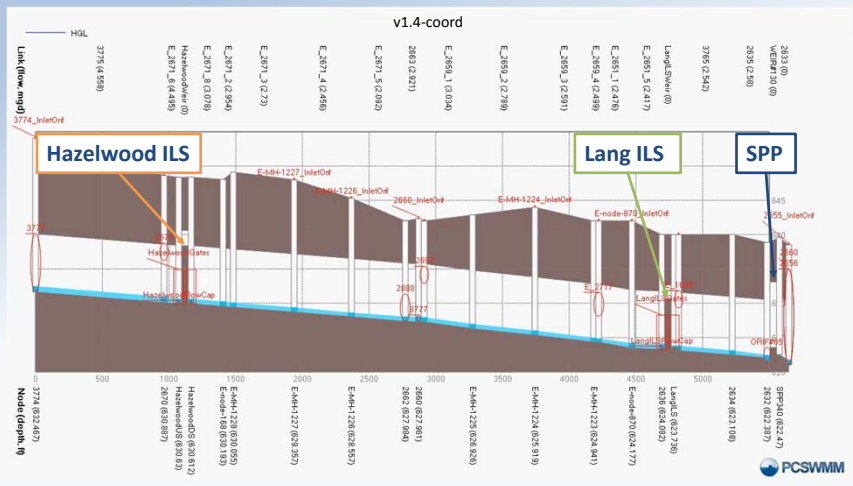
Hazelwood and Lang Coordinated Control



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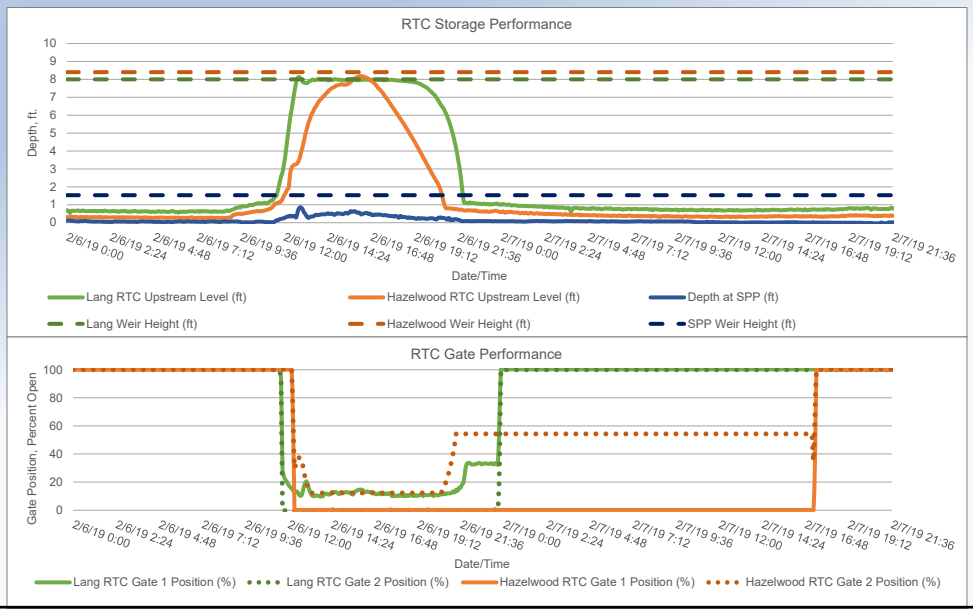
Hazelwood and Lang Coordinated Control



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Hazelwood and Lang KPIs

February 6, 2019		1
RTC Site	Lang	Hazelwood
Mode	Auto-Local	Auto-Remote
Gate Activation Trigger Depth:	1.45 ft.	1.85 ft.
Return to Normal Depth:	1.07 ft.	0.36 ft.
Time Gate 1 Activated:	2/6/2019 11:30	2/6/2019 12:10
Time Gate 2 Activated:	2/6/2019 11:30	2/6/2019 12:10
Time Gate 1 Returned to Normal:	2/6/2019 23:50	2/7/2019 17:25
Time Gate 2 Returned to Normal:	2/6/2019 23:50	2/7/2019 17:25
Depth of Weir	8 ft.	8.4 ft.
Maximum Depth Reached:	8.00 ft.	8.19 ft.
Volume Stored:	844,449 Gal.	1,094,076 Gal.
Unused Storage Volume:	0 Gal.	54,119 Gal.

Percent Capture	100%
Overflow Volume:	0 Gal.
Overflow Volume Prevented:	1,938,525 Gal.
SPP Activation Prevented:	Yes
If No, what is the overflow volume when storage was available?	NA
If No, could SPP activation have been prevented?	NA
If Yes, could SPP activation have been prevented without Hazelwood storage?	No

SPP:	340
Analysis Date:	2/22/2019
Event Start Date/Time:	2/6/2019 11:30
Event End Date/Time:	2/6/2019 23:50
Analyst Name, Organization:	Kristina Macro, EmNet
Total Rainfall Accumulation:	0.16 in.
Storm Event Duration:	2 hr.
Storm Type:	Less than 1 yr. storm

Recommended Operational Changes/Notes:

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2020 and Beyond

- RTCs have helped prevent nearly 2 billion Gallons of overflows since their installations
- Whole System Coordinated control of RTC sites is our next venture.
- Intelligent Systems have also saved energy, operational costs, and eliminated costly planned capital improvements

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Advanced Asset Management

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Applying Asset Management Principles and Examining the changing asset management landscape

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Advanced Asset Management Builds Upon Traditional Asset Management Frameworks

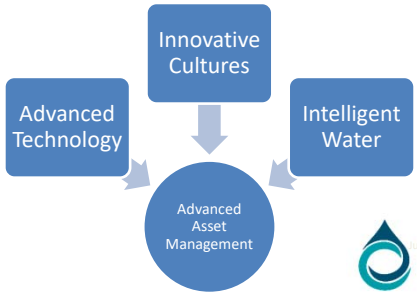
Traditional Asset Management (limitations)

- Focused on physical infrastructure
- CAPEX for repair and replacement prioritization
- Historical data and snapshots
- Relies heavily on industry standards

Advanced Asset Management (enablers)

- Focused on total assets (date, people, etc.)
- TOTEX optimization (CAPEX & OPEX)
- Real-time data streams
- Continuously learns - utility specific

What's enabling progress?



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Capital Improvement Planning Traditional Versus Advanced

Traditional Capital Improvement Planning

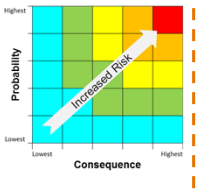
CONDITION SCORE x CONSEQUENCE SCORE x REDUNDANCY FACTOR = ASSET RISK SCORE

Probability of Failure

- Asset conditions and performance standards

Consequence of Failure

TBL Criteria
- Economic
- Environmental
- Social



Advanced Capital Improvement Planning

Historical Data and Industry Standards

VS

Real Time Data and Continuous Learning

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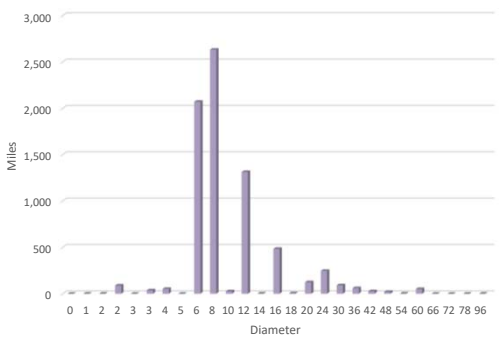
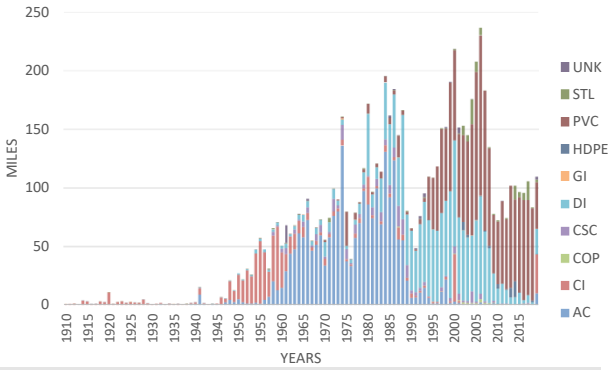
Challenge – Proactively Plan for Replacement of Over 7,000 Miles of Water Mains in San Antonio

Over 7,300 Miles of 4 through 96 inch Pipe



Installed Between 1910 and 2019



Primarily AC, DI and PVC 6 to 12 Inches in Diameter

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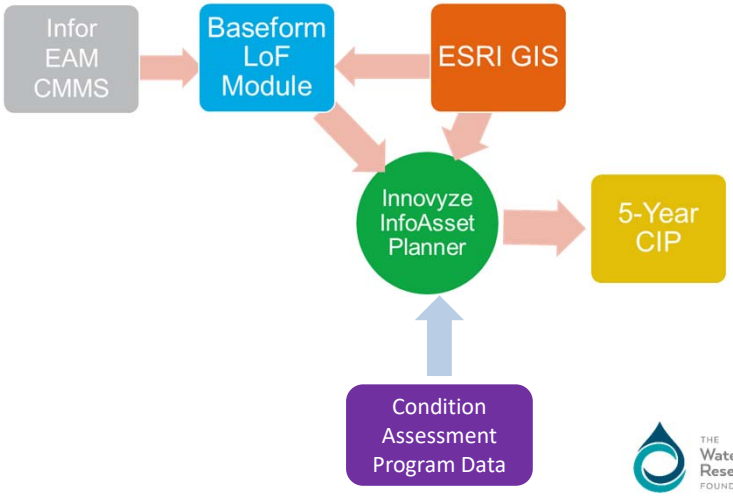
Solution - Apply Advanced Software to Support Improved Decision Making

Baseform:

- Predicts pipeline likelihood of failure for small diameter mains using statistics and machine learning.
- Ability for real time work order data integration.

InfoAsset Planner:

- Applies decay curves to predict likelihood of failure for large diameter mains.
- Calculates risk and creates projects that can be prioritized against each other.
- Decision trees and logic allow for frequent updates as data changes



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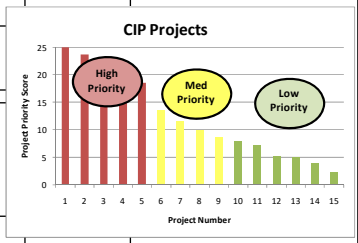
Results - Prioritized and Updatable 5-Yr CIP

- Logical Projects Prioritized Using Specific Criteria
- Approx. $30M/Year in Needs
- Projects $1 to $10M
- Coordinated with Sewer and Governmental Work for Minimum Disruption
- Can be Revised Easily as Available Funding Changes

CATEGORY	DESCRIPTION	RATING	WEIGHTING PERCENTAGE (%)	SCORE
		Financial Criteria		
Pavement Condition	The current pavement condition score of the roads involved, if the project will require road restoration as part of the scope of work.	1 – Pavement Condition Index is >86 for majority of project 2 – Pavement Condition index is >86 for portions of project 3 – Pavement Condition Index is <86 for majority of project 4 – N/A 5 – No Pavement Restoration Required	**15%**	5
Risk Reduction Efficiency	The dollars spent per reduction in average risk score of the asset contained in the project. For assets replaced assume the condition returns to a score of 1.	1 – Very Poor; >$1,000,000 2 – Poor; $701,000 - $999,000 3 – Fair; $451,000 - $700,000 4 – High; $201,000 - $450,000 5 – Very High; <$200,000	**25%**	
		Social Criteria		
Asset Consequence of Failure	The ability of the system to meet customer service levels when asset failures occurs. The consequence of failure is performed through a desktop evaluation using GIS. Use the average score for the assets in the project and include the redundancy factor if applicable.	1 – Insignificant; score=1-1.5 2 – Minor; score = 1.6-2.3 3 – Moderate; score = 2.4 – 3.5 4 – High; score = 3.6– 4.2 5 – Very High; score = 4.3 - 5	**15%**	
Alignment with Governmental or Sewer CIP Projects	The project scope and schedule cover an area that is also scheduled for a future governmental or sewer project so that there is public disturbance in the area only one time and not several times over a number of years.	1 – No project overlaps 2 – N/A 3 – Overlaps with 1 project 4 – N/A 5 – Overlaps with 2 or more projects	**15%**	3
Asset Condition	The current state of repair and operation for the asset as influenced by age, and service/operating conditions. Use the average condition score for the assets in the project based on breaks per hundred miles per year (break rate) or % remaining wall thickness.	1 – >11 break rate; <5% loss 2 – 11 to 30 break rate; 6-15% loss 3 – 31 to 55 break rate; 16- 30% loss 4 – 56 to 80 break rate; 31-50% loss 5 – >80 break rate; >50% loss	**30%**	5
			TOTAL:	**3.9 (78%)**



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Denver Water Perspective

"an item, thing or entity that has potential or actual value to the Denver Water organization. This value will vary between different divisions and stakeholders and may be tangible or intangible, financial or non-financial"

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Recommendation #1

Standardization of water customer classes and adoption of uniform class definitions.

- List of 17 primary categories as an initial basis for future refinements
- Supports more refined evaluation of trends and water use modeling
- Provides better level of detail for deriving water use metrics
- Permit more meaningful comparisons across utilities

Initial Recommended Customer Classification Scheme

No.	Principal Category	Example Potential Subcategories
1	Single-family Residential	Single-family homes
2	Multifamily Residential	Duplex Triplex Apartments buildings Mobile home parks
3	Dominant End Use	Commercial/industrial laundries Laundromats Car washes City parks and recreation areas Public pools and water parks Golf courses Landscape irrigation—only
4	Lodging	Hotels and motels without irrigation & cooling Hotels and motels with irrigation & cooling Resort/large convention hotels
5	Office Buildings	Large office with cooling towers Office complexes with irrigation Small office without cooling towers and irrigation
6	Schools	Pre-schools and daycare Primary and secondary schools Universities/college campuses
7	Health Care	Hospitals and sanitariums Medical centers, doctor offices, and labs
8	Eating Places	Full service restaurants Fast food outlets Bakeries & cafeterias
9	Retail Stores	Shopping centers and malls Grocery stores and supermarkets Convenience stores
10	Warehouses	Warehousing cold storage Other warehouses
11	Auto Service	Auto service
12	Religious Buildings	Religious buildings
13	Retirement Homes	Long-term nursing homes Retirement homes
14	Manufacturing	Heavy industry plants Light industry plants Food and beverage processing plants Other manufacturing establishments
15	Largest CII Customers	Top quantity customers
16	Other Commercial	Personal services (beauty shops, health spas, fitness) Miscellaneous commercial
17	Other Institutional	Correctional facilities Group live-in shelters Miscellaneous institutional

Source: Kiefer, J.C. and L.R. Krentz. 2016. *Evaluation of Customer Information and Data Processing Needs for Water Demand Analysis, Planning, and Management.* Denver: Water Research Foundation.

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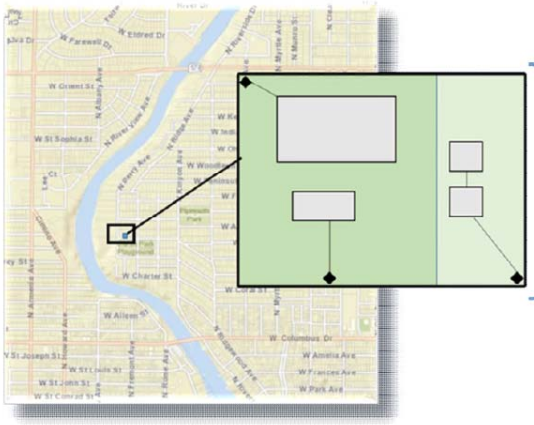
"Geographical referencing of water customers and **unique locations**"



- 1 water use **location** associated with:
  - 1 business or function associated with:
    - 4 buildings
    - 2 tax parcels
    - 3 water meters

Associates metered water use records to the physical boundaries where water use occurs.

Source: Kiefer, J.C. and L.R. Krentz. 2016. *Evaluation of Customer Information and Data Processing Needs for Water Demand Analysis, Planning, and Management*. Denver: Water Research Foundation.

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Customer Model Dashboard
Updates
None
Month
FILTERS
Use the following to filter the dashboard elements to a Neighborhood, Distributor Boundary, or Customer Model Type.
Grocery
Healthcare
Hotel
Ind - Brewery
Ind - Growhouse
Ind - Other
Ind - Warehouse/Storage
Irr - Golf Course
Irr - HOA
Irr - Other
Irr - Park
Irr - Public Space
Irr - Special District
Irr - Urban Garden
Master Meter
Mixed Use
Multi-Family
Office
Other
Restaurant
Retail
School - Elementary
School - High School
School - K-8
School - Middle
School - University/College
School Other
Single-Family Attached
Single-Family Detached
City Park West
Cheesman Park
County and City of Denver, Esri, HERE

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Thank You
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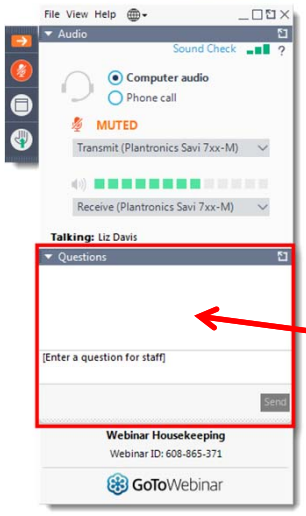
Questions and Answers



Submit your questions using the Questions pane.

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