

LEVERAGING AN ADVANCED ASSET MANAGEMENT FRAMEWORK TO OPTIMIZE INVESTMENT DECISIONS

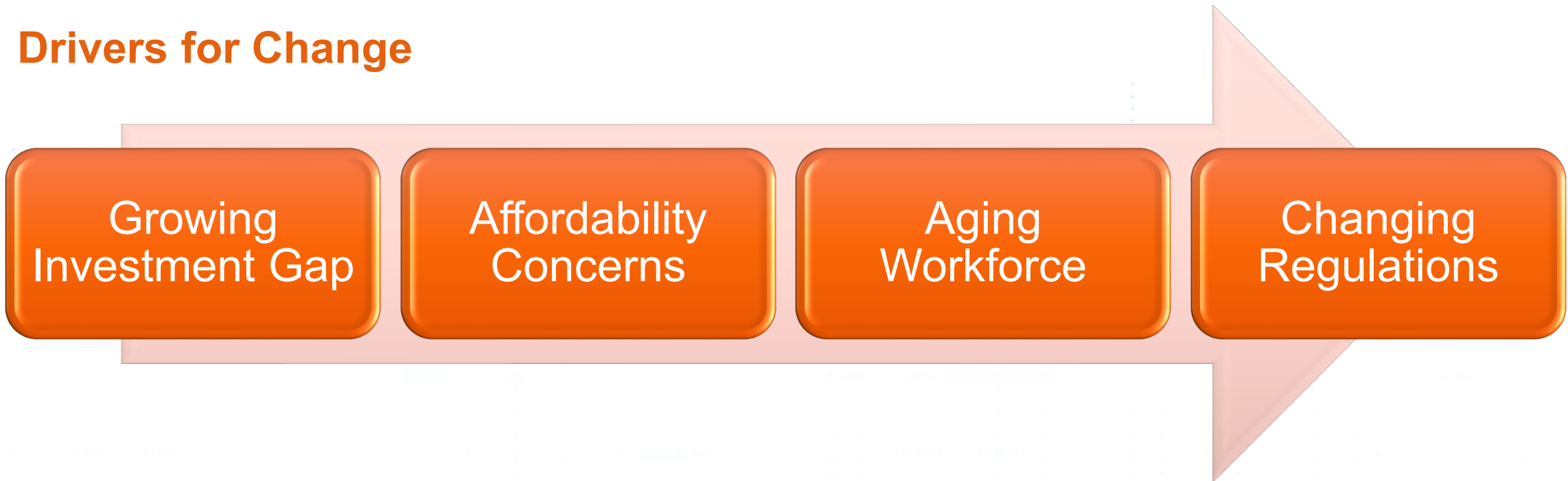
July 28, 2021



What is Advanced Asset Management?

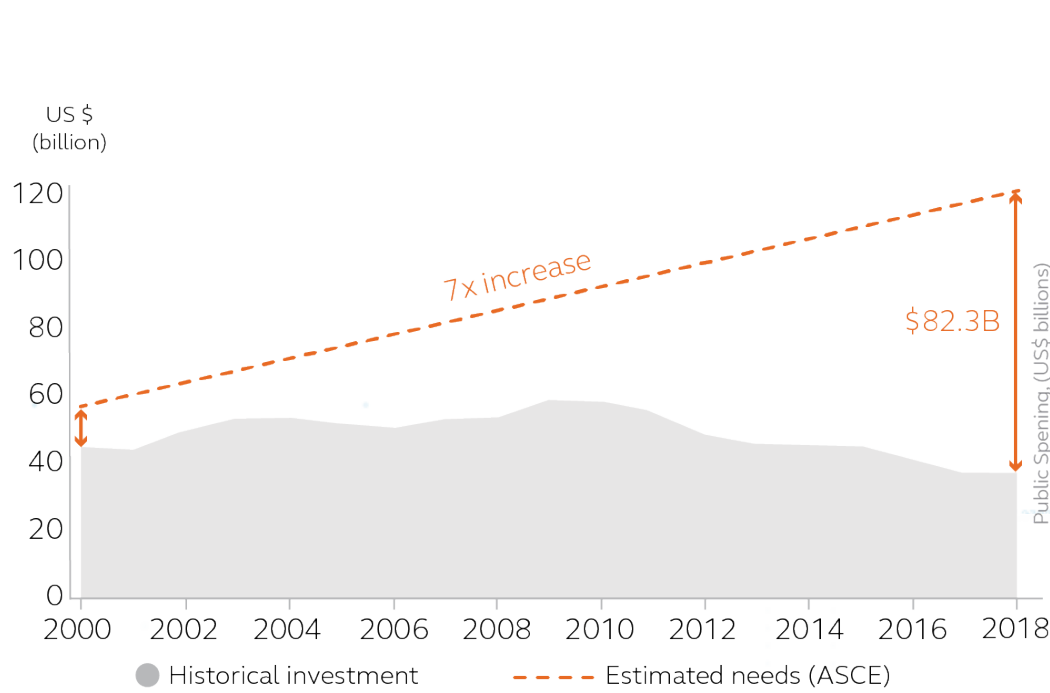
An **enhancement** of the traditional asset management framework that adds **digital skillsets and technologies**, focuses on **total expenditures** and considers assets beyond the physical infrastructure. These elements work together to **optimize** spending decisions, reducing the infrastructure funding gap while maintaining assets at an acceptable **service level**.

Drivers for Change

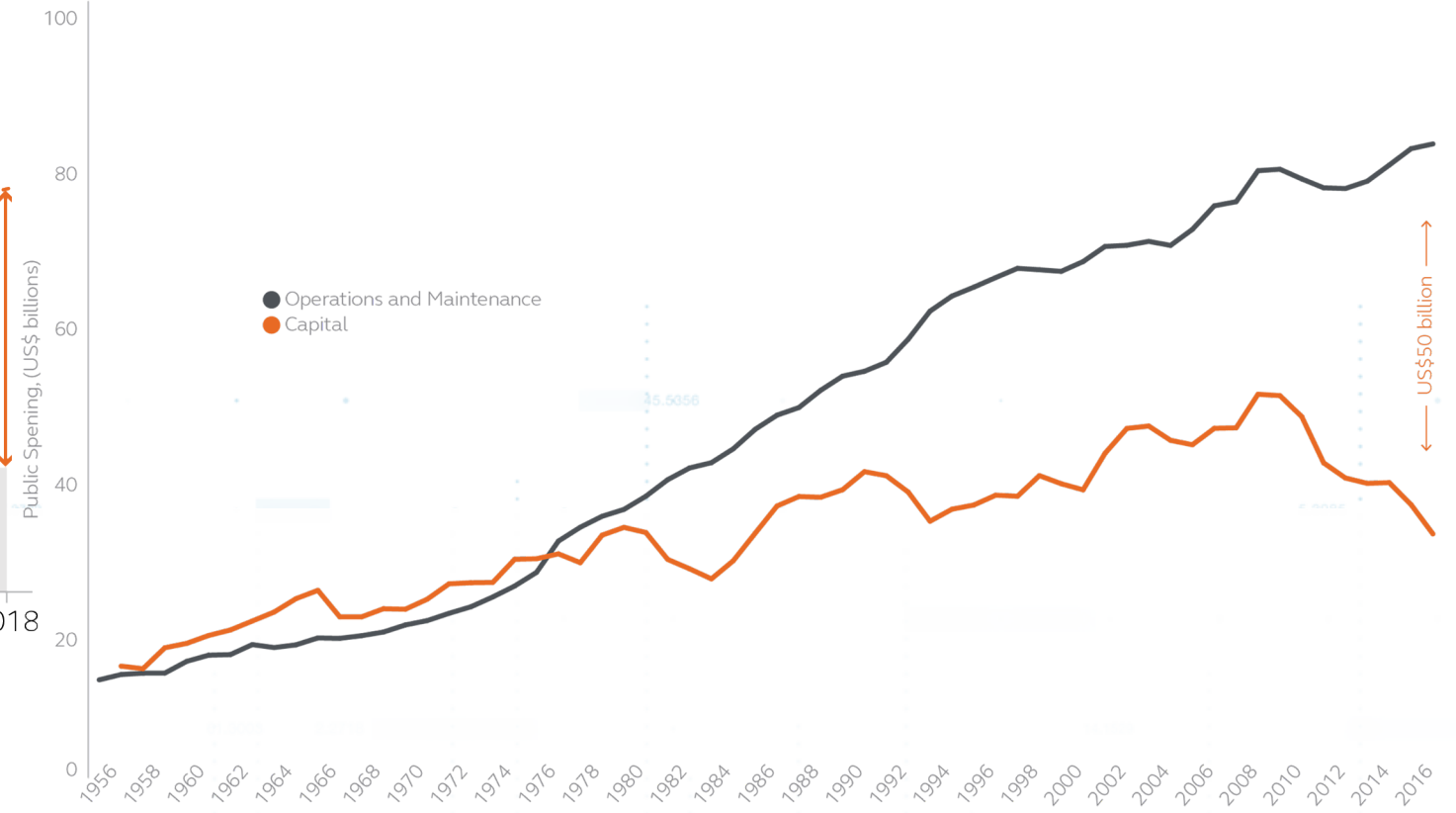


Get ahead of rising costs

Water and wastewater capital needs vs. historical investment

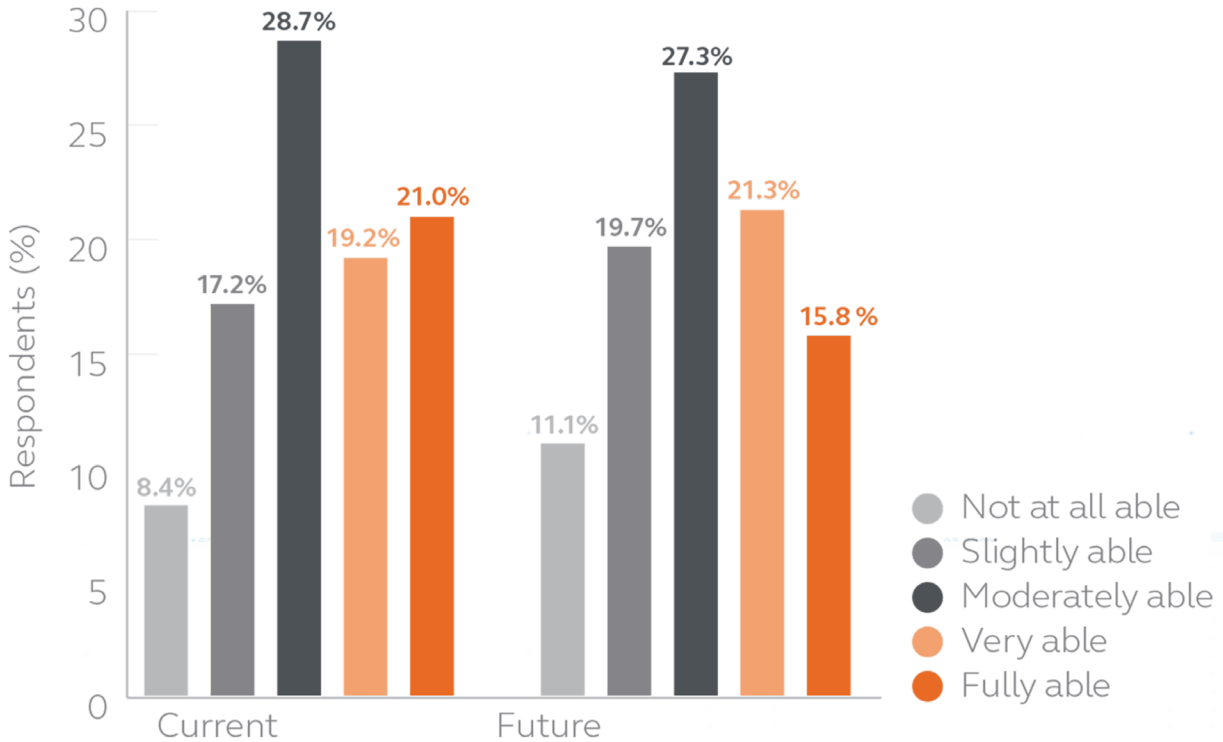


Sources: American Society of Civil Engineers, U.S. Congressional Budget Office, Bluefield Research

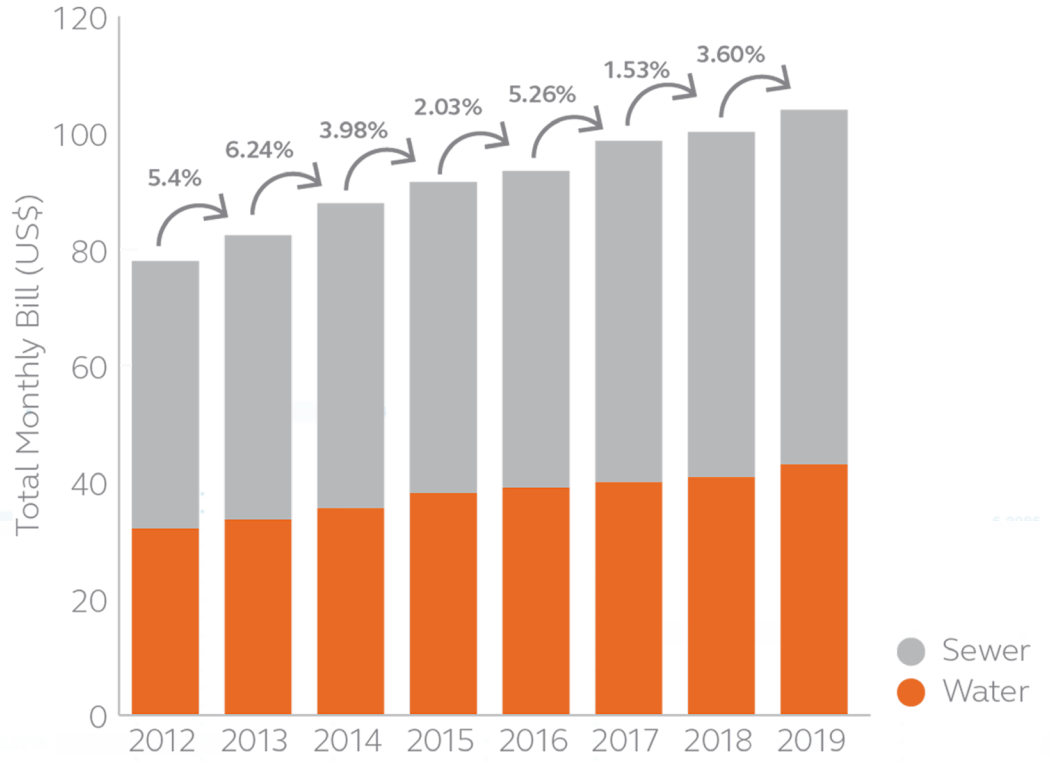


Public spending on Capital and O&M Investments, 1956-2016. Source: Bluefield Research using U.S. Congressional Budget Office data.

Are utilities equipped to cover costs?

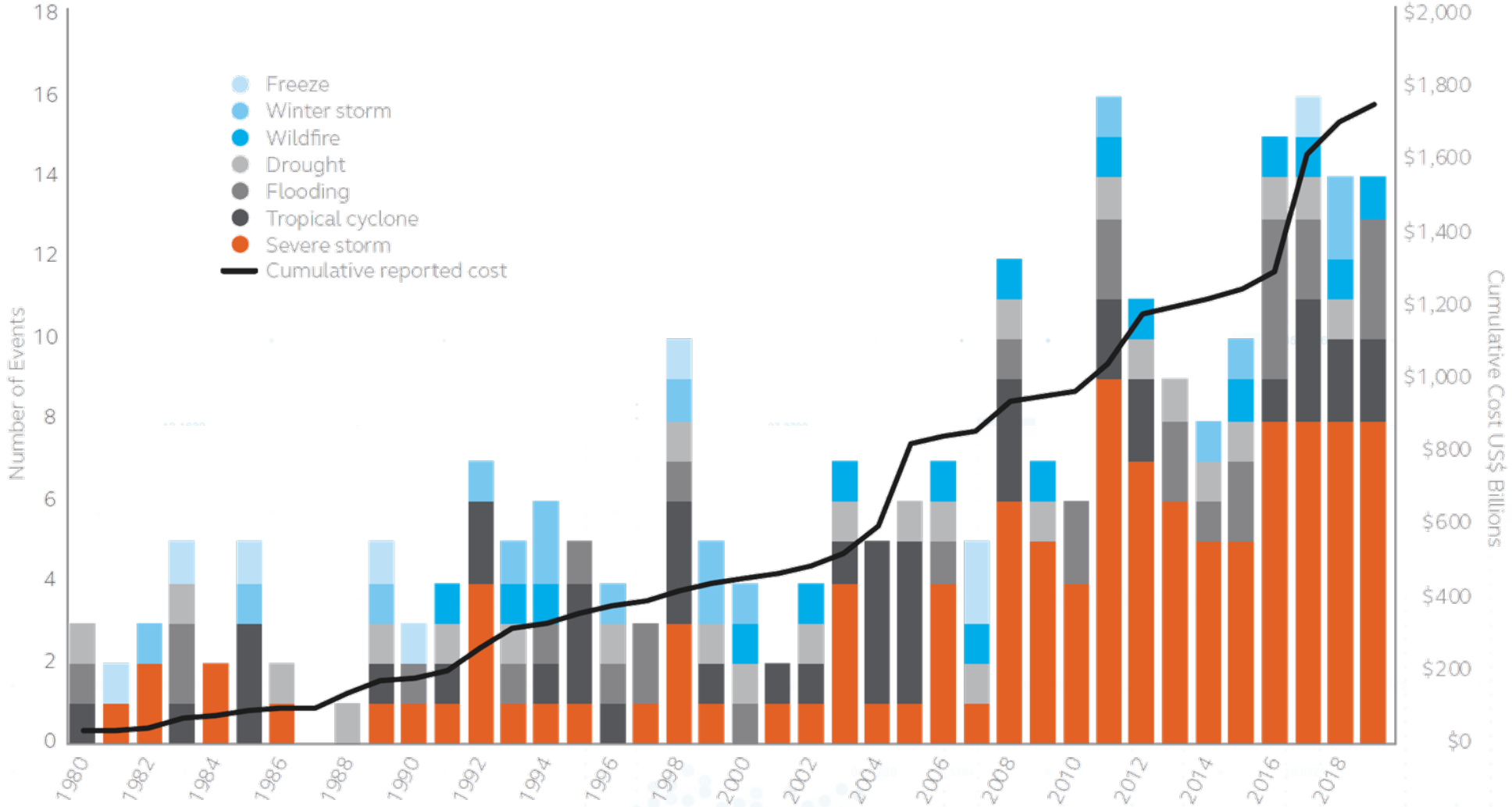


Assessment of a utility's ability to cover the full cost of providing service currently and in the future. Source: American Water Works Association..



Water and Wastewater Monthly Bills for Largest U.S. Cities by Population Served, 2012-2019. Source: Bluefield Research.

The costs of acute shocks are rising



Asset fitness is the durability of assets. It incorporates asset management and data optimization capabilities as they relate to common physical fitness attributes: redundancy, resistance, reliability, and having assets to help respond and recover from incidents.

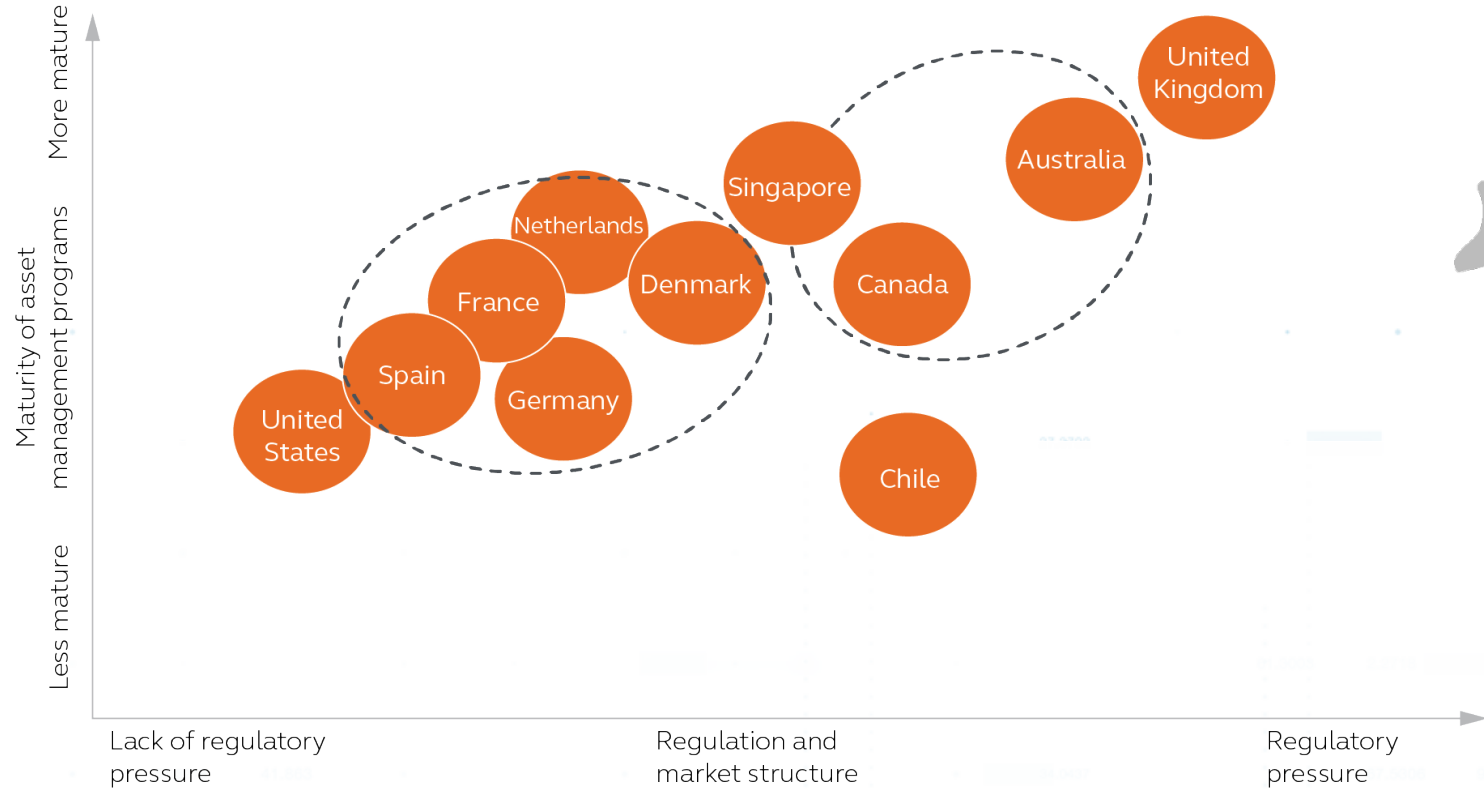


Organizational health are the people-centric processes, products and tools that maximize the performance of physical assets and people. These essential resilience elements fortify organizations the ways proper nutrition and sleep benefit athletes.

Billion-Dollar Disasters: Number and Cost of U.S. Weather-Related Disasters, 1980-2019. Source: National Centers for Environmental Information. © Arcadis 2021

Increasing Regulations

Maturity of asset management programs vs. regulation and market structure, globally



Sources: Bluefield Research



Ohio Environmental Protection Agency
Division of Drinking and Ground Waters

Asset Management Program – Small Community Guidance

Division: DGRDW
Number: DGRDW-20-001
Category: Operations – Guidance
Status: Final
Issued: November 8, 2019

I. PURPOSE:
This guidance, applicable to home owners, associations, mobile home parks, villages, nursing homes, towns, and any other public water system of comparable size, summarizes the contents of an Asset Management Program for Small Community Water Systems.

II. BACKGROUND:
Asset management has many different definitions. In the end it boils down to getting the most out of your assets at the lowest cost to the system. If other words, a water system should be servicing assets frequently enough that the assets are not falling apart, but are doing what they are meant to, without spending more time or money than is necessary to achieve those results.

The Asset Management Rules in Chapters 3745.07 and 3745.02 of the Ohio Administrative Code (OAC) reflect the statutory change of Ohio Revised Code (ORC) Section 3745.24 which had an effective date of October 8, 2017, along with the existing capability rules to address the managerial, technical, and financial capability of water systems. These rules require all public water systems to have a written asset management program available for on-site inspection, however some water systems may be asked for a demonstration of their asset management program in more detail. A system may be asked for a demonstration in more detail if they are seeking to receive a loan, are going through a reformation, or are otherwise struggling with capability issues.

For an asset management program to be effective, it needs to be a dynamic program that is implemented and continuously updated. Metrics will be used to ensure that asset management programs are being implemented. All water systems are required to track

ASSET MANAGEMENT PROGRAM GUIDANCE FOR THE INDIANA STATE REVOLVING FUND LOAN PROGRAM

July 2018

April 2016

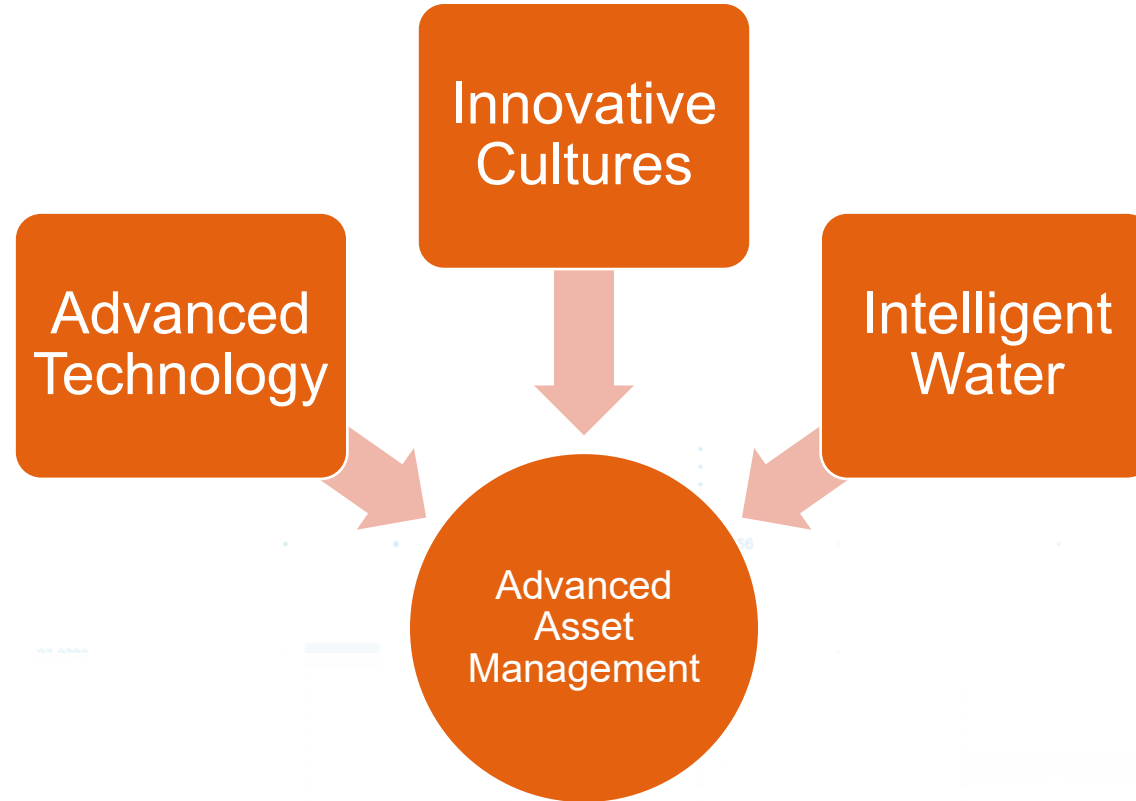
New Jersey Department of Environmental Protection
Division of Water Quality
0408120017

[ASSET MANAGEMENT PLAN ASSESSMENT GUIDE]

THE PURPOSE OF THIS GUIDE IS TO PROVIDE A FRAMEWORK FOR THE ASSESSMENT OF THE CURRENT AND FUTURE ASSET MANAGEMENT PROGRAMS OF PUBLIC WATER SUPPLY SYSTEMS. THE GUIDE IS INTENDED TO BE USED AS A TOOL TO ASSESS THE CURRENT AND FUTURE ASSET MANAGEMENT PROGRAMS OF PUBLIC WATER SUPPLY SYSTEMS. THE GUIDE IS INTENDED TO BE USED AS A TOOL TO ASSESS THE CURRENT AND FUTURE ASSET MANAGEMENT PROGRAMS OF PUBLIC WATER SUPPLY SYSTEMS.

Traditional vs Advanced Asset Management

What's enabling progress?



Traditional Asset Management (limitations)

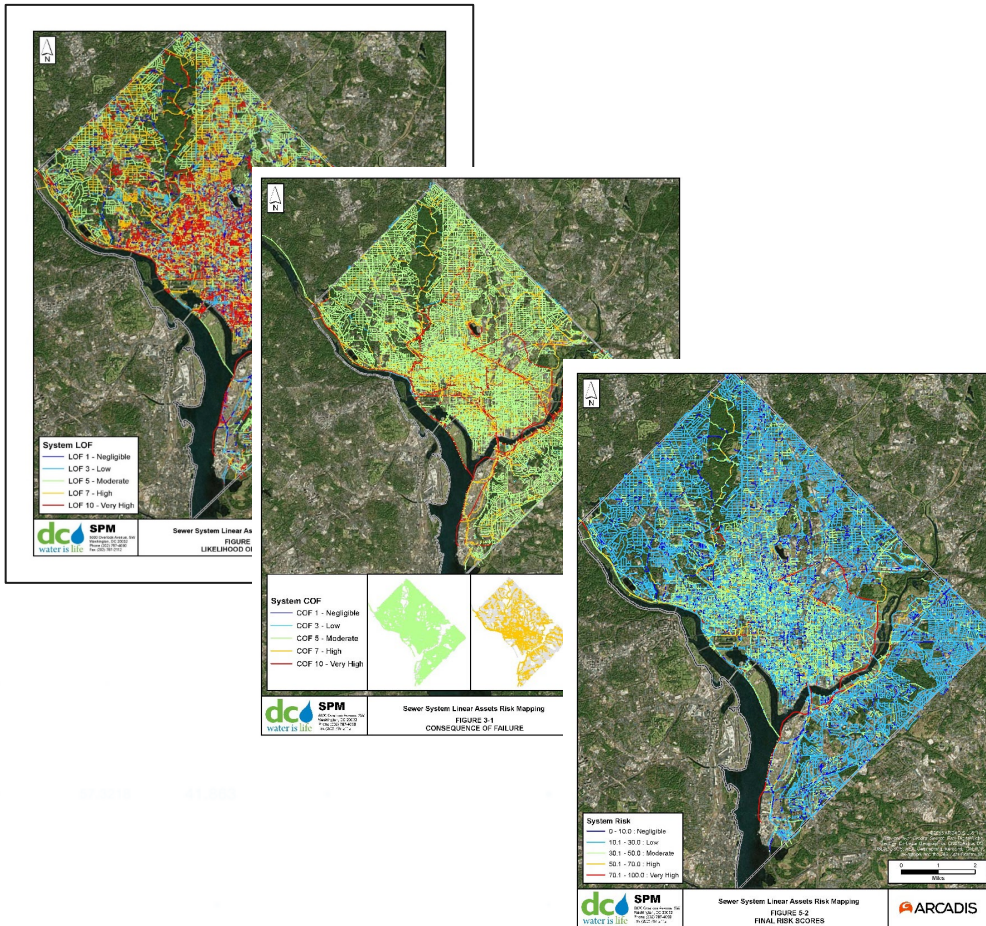
- Focused on physical infrastructure
- CAPEX for repair and replacement prioritization
- Historical data and snapshots
- Relies heavily on industry standards

Advanced Asset Management (enablers)

- Focused on total assets, incl. people
- TOTEX optimization
- Real-time data streams
- Continuously learns - utility specific

Physical Infrastructure vs Total Asset Focus

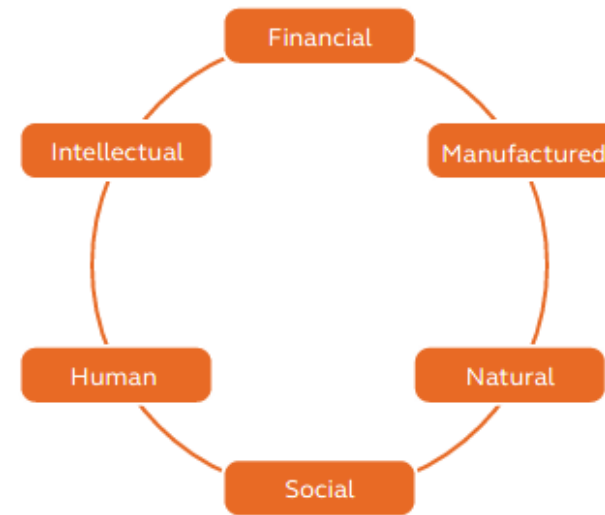
Physical Infrastructure



vs

Total Asset Focus

Yorkshire Water's Six Capitals framework



Sources: Yorkshire Water, Natural Capital Coalition, Bluefield Research

Capital Investment Planning vs Totex Expenditure Planning

Capital Investment Planning

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

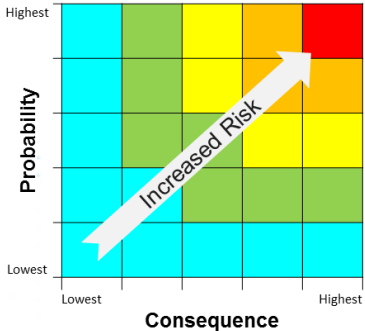
Probability of Failure

- Asset conditions and performance standards

Consequence of Failure

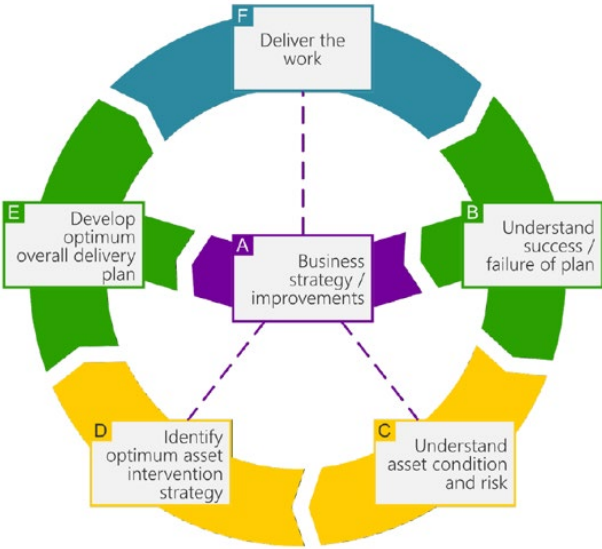
TBL Criteria

- Economic
- Environmental
- Social



Prioritization

Total Asset Investment Planning

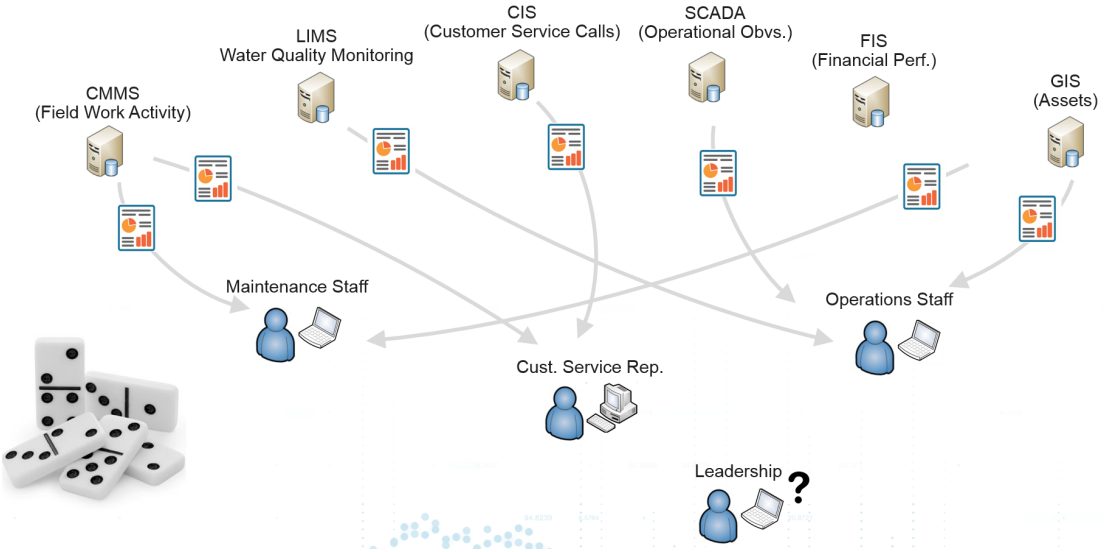


Optimization

VS

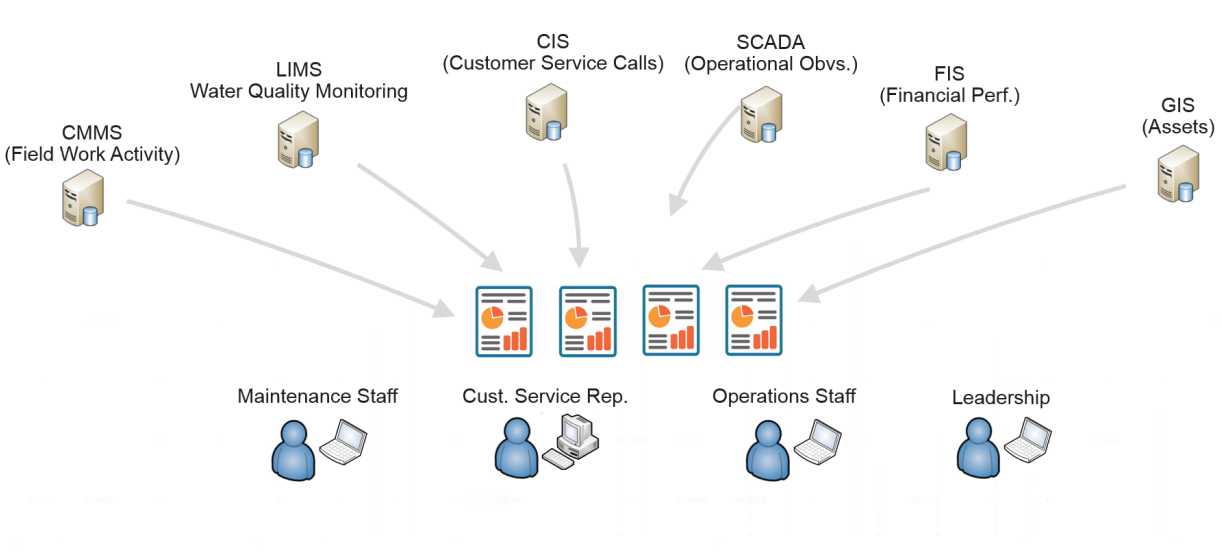
Historical data vs Real-Time Data

Historical Data



VS




Real-Time Data









Looking Beyond the Surface

The foundations of tech we experience everyday are being applied in the water sector



-  Self-Driving Cars and Planes
-  Virtual Assistants
-  Product Recommendations

-  Data Readiness
-  Visualization
-  Machine Learning
-  Digital Twins
-  Edge Processing
-  Artificial Intelligence

Leveraging Tool to Support Investments

Data Profiling



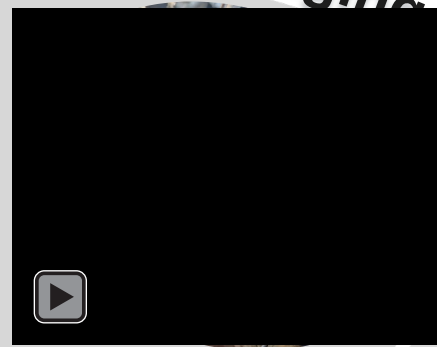
Mobile Data Collection



Data Collection and Quality Monitoring



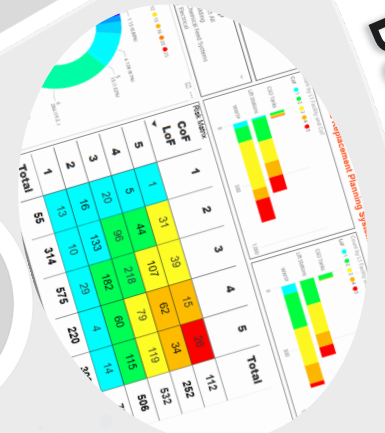
360 Imaginer



Capital Planning



Deliverables





Analytics 101

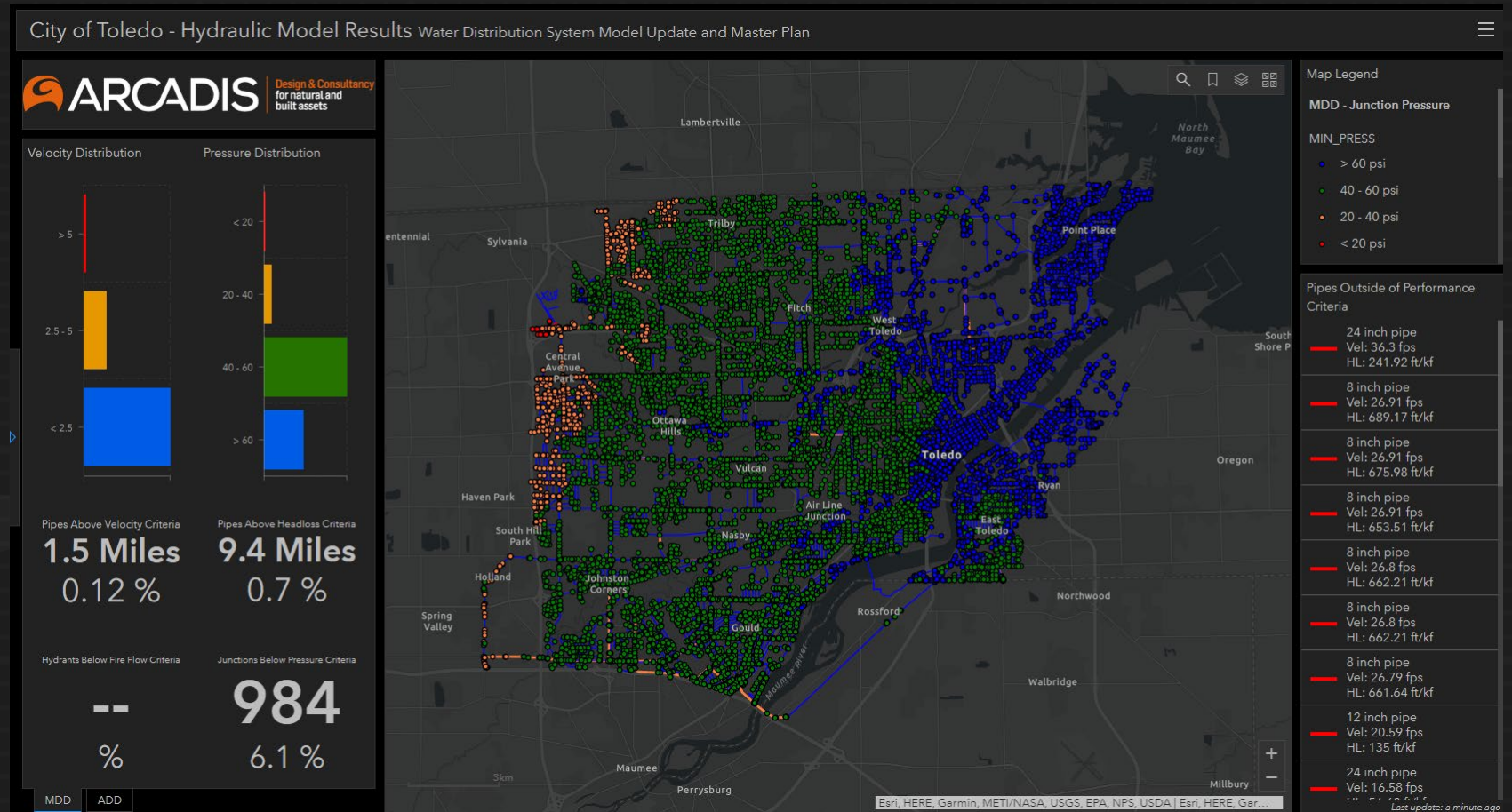
Visualization: Walk before you Run

WHAT & HOW

Less raw data, more insight
Many applications for simple dashboard development

BENEFIT

Increase the value of your data efforts through basic visualization and development of dashboards



Data Readiness

- Streamline the process



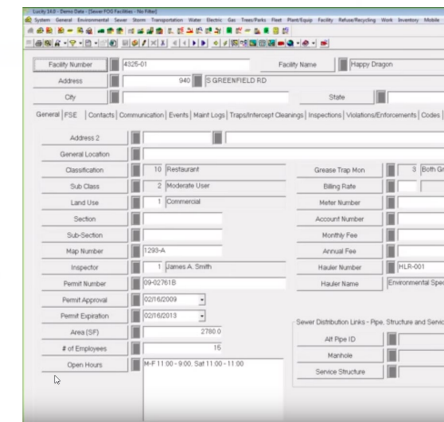
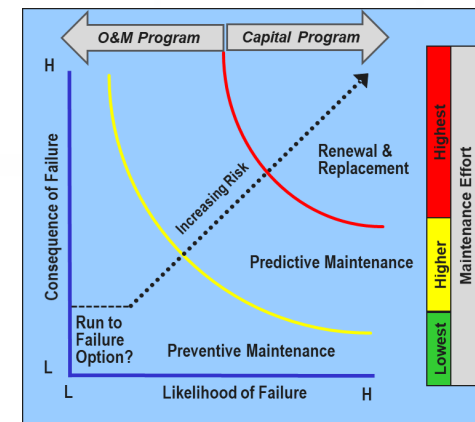
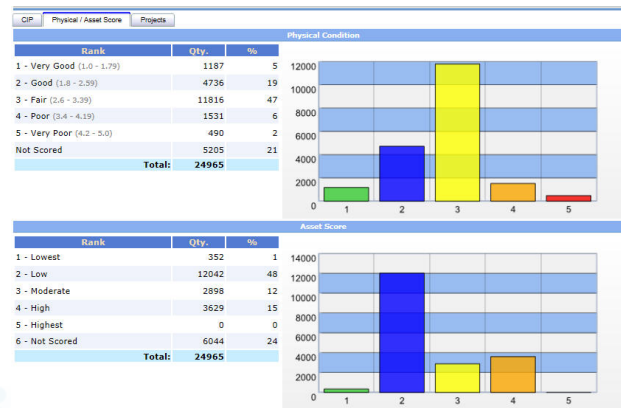
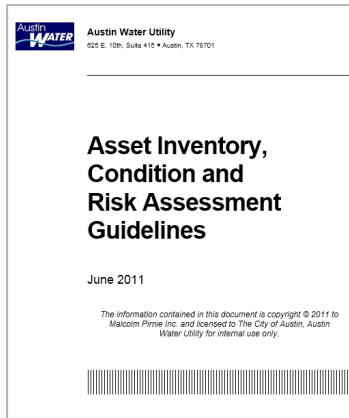
Define

Collect

Analyze

Plan

Integrate



Mobile Applications Delivers Fast and Accurate Field Data Collection




ASSESS:

- Mechanical
- Electrical
- I&C
- Structural
- HVAC

Water Asset Management - GLWA

RACK, BAR, #1 BAR RACK; CONNOR CREEK CSO BASIN CONNOR CREEK CSO RACK AND GRIT BLDG, Gre...



Inventory Information

Field Code

Field Code • Condition Assessed

Condition Assessment

Physical Condition Assessment Core

Corrosion	4 - Surface Only >50-75%, Structural - 1 Location
Corrosion Comments	• Surface corrosion throughout and evidence of structural damage
Leakage	2 - Gaskets / Connections: Historic only, Holes / Failures: None
Leakage Comments	
Vibration	3 - Apparent with Noise: Yes, Non-Structural Damage: None, Structural Damage: None
Vibration Comments	
Concrete Pedestals	2 - Surface Cracking / Loose Grout: <10%, Through Cracks: None, Missing Pieces: None
Concrete Pedestals Comments	
Steel Supports	2 - Surface Corrosion: <10%, Structural Corrosion: None, Missing/Broken Anchors: None
Steel Supports Comments	

CMMS Database + New Assets in Field Central Tracking for Data Completeness and Quality



Filter Data

▼ Record Updated

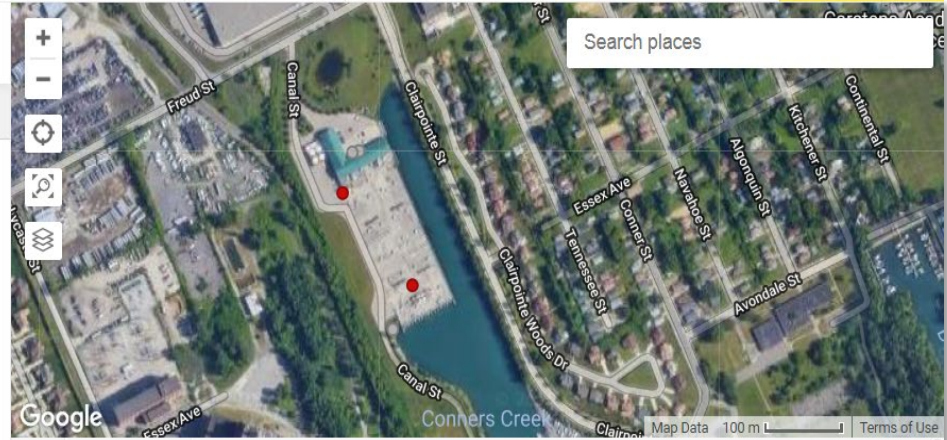
- All
- Today 12/01/2018
- Yesterday 11/30/2018
- Last 7 days 11/24/2018 - 12/01/2018
- Last 30 days 11/01/2018 - 12/01/2018
- This Month 12/01/2018 - 12/31/2018
- Last Month 11/01/2018 - 11/30/2018
- Specific Range

Start date... - End date...

From To

▼ Status

- Inspected
- Outstanding



▼ Status	▼ Title
Inspected	RACK, BAR, #1 BAR RACK; CONNOR CREEK CSO BASIN CONNOR CREEK CSO RACK AND GRIT BLDG., Great Lakes Water Authority ▶ Wastewater Treatment ▶ CSO Sites ▶ Conner Creek ▶ Common Support System ▶ Building
Outstanding	GENERATOR, EMERGENCY, GAS CSO BASIN, CONNOR CREEK, Great Lakes Water Authority ▶ Wastewater Treatment ▶ CSO Sites ▶ Conner Creek ▶ Common Support System ▶ Electrical
Outstanding	SYSTEM, ODOR CONTROL # 1 CONNOR CREEK CSO, Great Lakes Water Authority ▶ Wastewater Treatment ▶ CSO Sites ▶ Conner Creek ▶ Common Support System ▶ Building
Inspected	PUMP, CENTRIFUGAL, SODIUM HYPOCHLORITE #1 CONNOR CREEK CSO BASIN #1, Great Lakes Water Authority ▶ Wastewater Treatment ▶ CSO Sites ▶ Conner Creek ▶ Common Support System

Confidence in Data Collection

Search your data...
256 records
Clear All Filters
Download Data

Filter Data

▼ Record Updated


- All
- Today 02/21/2019
- Yesterday 02/20/2019
- Last 7 days 02/14/2019 - 02/21/2019
- Last 30 days 01/22/2019 - 02/21/2019
- This Month 02/01/2019 - 02/28/2019
- Last Month 01/01/2019 - 01/31/2019
- Specific Range

Start date... - End date...

From To

▼ Status

- Inspected
- Outstanding



Status	Title	Updated	Created By	Updated By	Hierarchy	Asset Name	Asset Number	Inspection Type
Inspected	Mag Flow Meter, PE Flow, Aeration Tank 5, Wastewater ▶ WWTP ▶ Aeration Tanks ▶ Aeration ▶ Instrumentation and Control	1/8/2019, 1:46:55 PM	Chris Muller	Sara Ferrara	Wastewater, WWTP, Aeration	Mag Flow Meter, PE Flow, Aeration Tank	00000679	Electrical
Inspected	Mag Flow Meter, PE Flow, Aeration Tanks 3 & 4, Wastewater ▶ WWTP ▶ Aeration Tanks ▶ Aeration ▶ Instrumentation and Control	1/8/2019, 1:46:54 PM	Chris Muller	Sara Ferrara	Wastewater, WWTP, Aeration	Mag Flow Meter, PE Flow, Aeration	00000682	Electrical
Inspected	Mag Flow Meter, ML/DW Flow, Wastewater ▶ WWTP ▶ Aeration Tanks ▶ Aeration ▶ Instrumentation and Control	1/8/2019, 1:46:55 PM	Chris Muller	Sara Ferrara	Wastewater, WWTP, Aeration	Mag Flow Meter, ML/DW Flow	00000685	Electrical
Inspected	Mag Flow Meter, PE Flow, Aeration Tanks 1 & 2, Wastewater ▶ WWTP ▶ Aeration Tanks ▶ Aeration ▶ Instrumentation and Control	1/8/2019, 1:46:55 PM	Chris Muller	Sara Ferrara	Wastewater, WWTP, Aeration	Mag Flow Meter, PE Flow, Aeration	00000686	Electrical
Inspected	Control/Monitor Panel, Primary Effluent, Wastewater ▶ WWTP ▶ Aeration Tanks ▶ Aeration ▶ Instrumentation and Control	1/8/2019, 1:46:56 PM	Michael Krizman	Sara Ferrara	Wastewater, WWTP, Aeration Tanks, Aeration,	Control/Monitor Panel, Primary Effluent	00000643	Electrical
Inspected	Air Compressor 1, Aeration Tanks 1-5, Wastewater ▶ WWTP ▶ Aeration Tanks ▶ Aeration ▶ Process Mechanical	1/17/2019, 2:52:39 PM	Scott Burger	Sara Ferrara	Wastewater, WWTP, Aeration	Air Compressor 1, Aeration Tanks 1-5	00000216	Mechanical
Inspected	Air Compressor 2, Aeration Tanks 1-5, Wastewater ▶ WWTP ▶ Aeration Tanks ▶ Aeration ▶ Process	1/17/2019, 2:52:40	Scott Burger	Sara Ferrara	Wastewater,	Air Compressor 2,	00000304	Mechanical

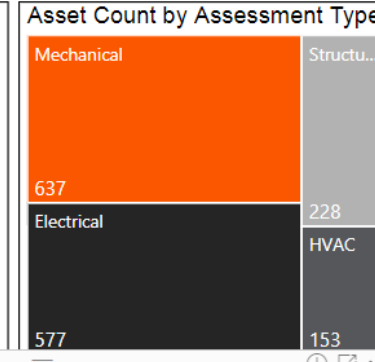
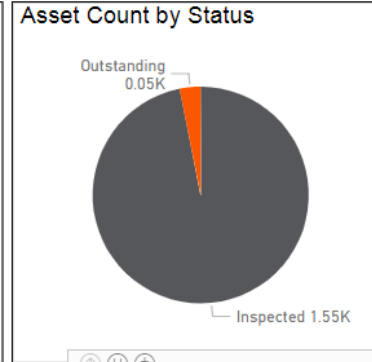
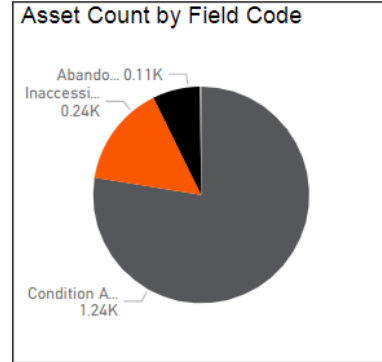
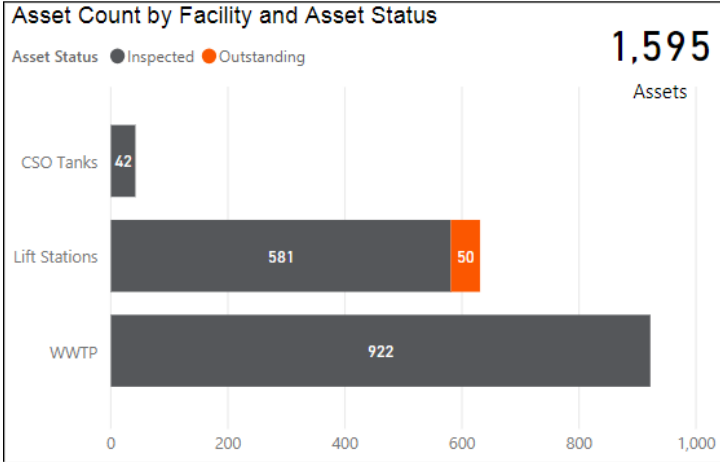
Data Collection Monitoring

Elkhart WW Facilities PBI v0.1

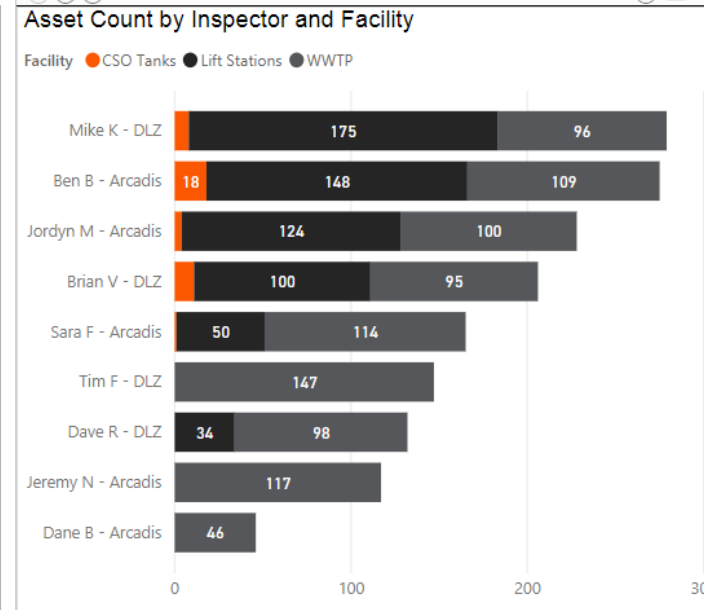
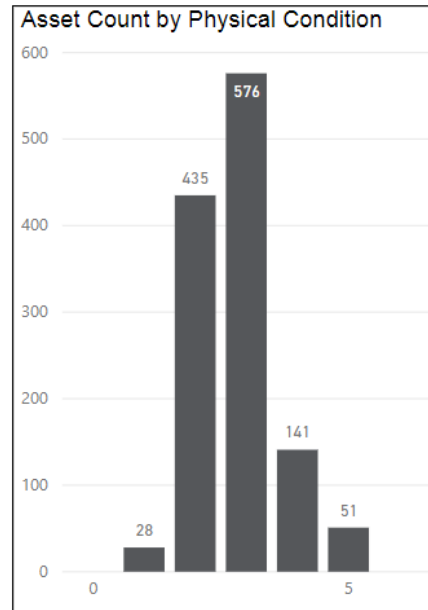
Arcadis Facility Condition Assessment Dashboard



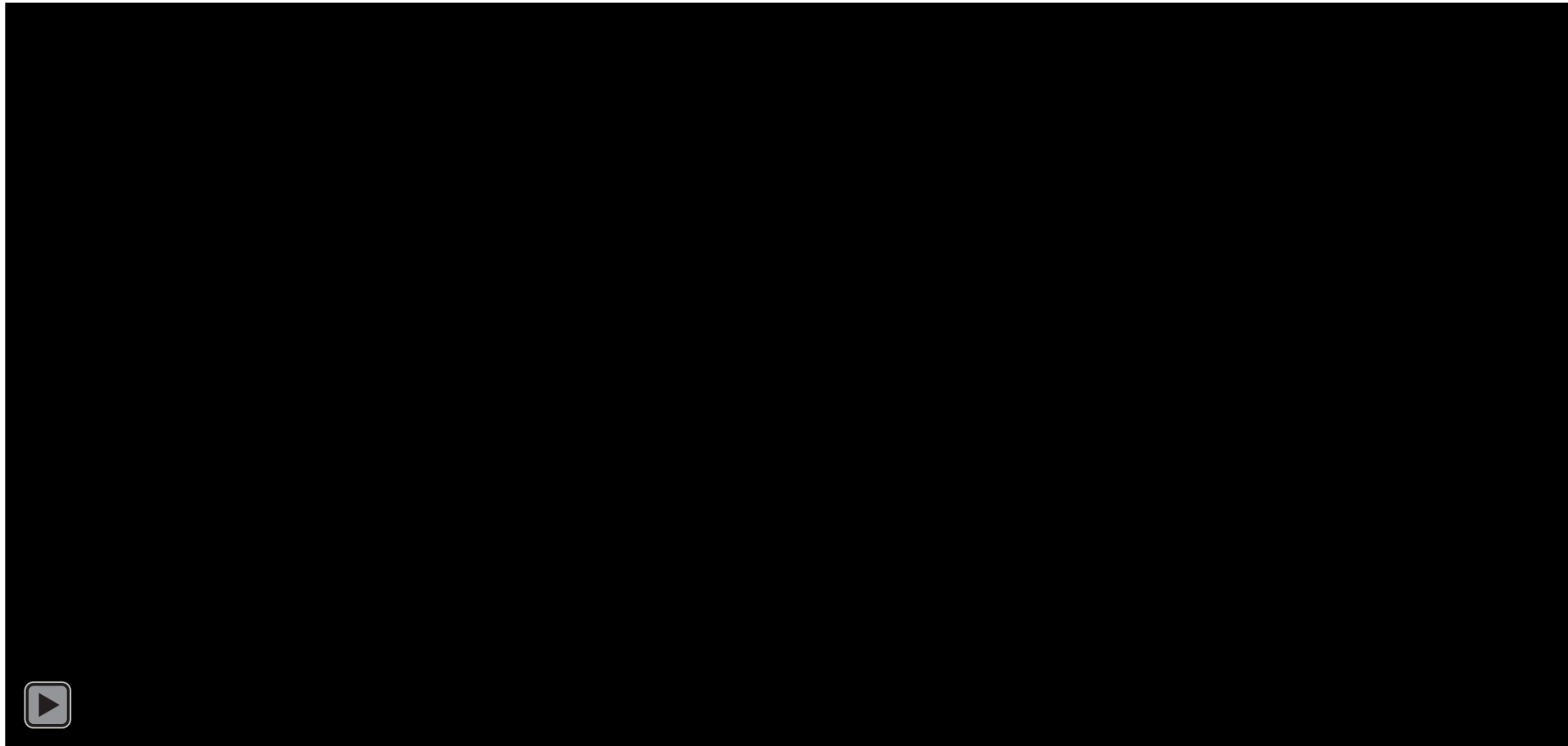
Last Refresh 2/19/2019 3:03:33 PM



Facility	Area	Process	Asset	Max C...	Photos
WWTP	Disinfection	Facility Support	Alarm Annunciator Panel 2		
WWTP	Plant Wide	Old Chlorine Building	Chlorine Building Roof		
Lift Stations	Cottage Ct	Pumping	Level Transducer		
Lift Stations	High Dive Park	Pumping	Level Transducer 2		
WWTP	Primary Clarifiers	Facility Support	Primary Building Roof		
WWTP	Digestion	Digestion	West Digester 3 Cover		
CSO Tanks	New Jackson	Storage	Wetwell		
WWTP	Final Clarifiers	Secondary Settling	Float Switch 2		
WWTP	Aeration Tanks	Aeration	Gate 4A, Aeration Tank 4 (Abandoned)		
WWTP	Plant Wide	Westside South Storage Building	Unit Heater 1, Westside South		

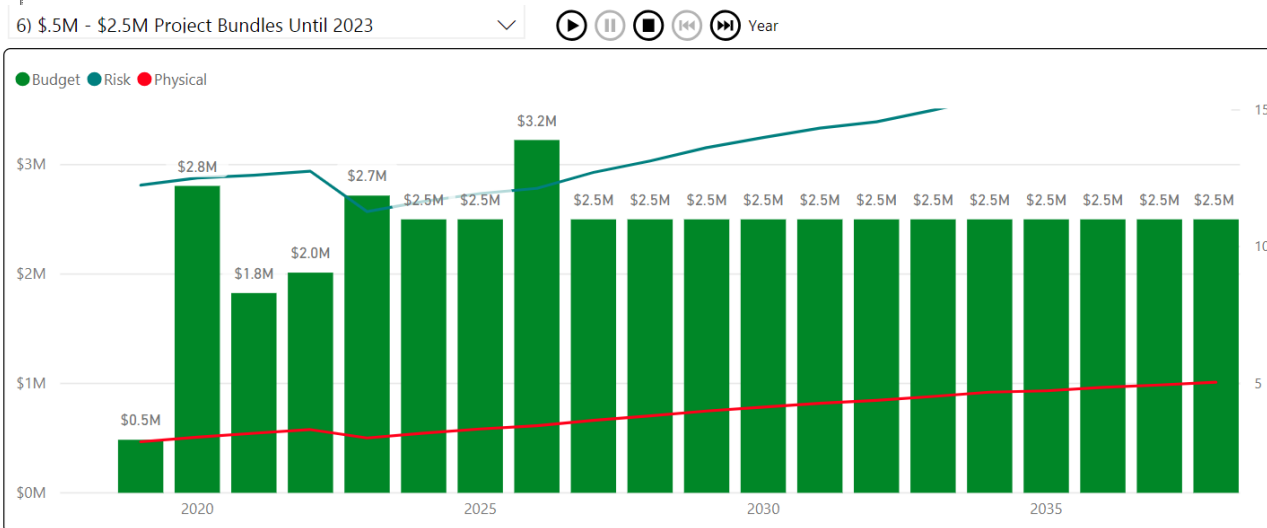
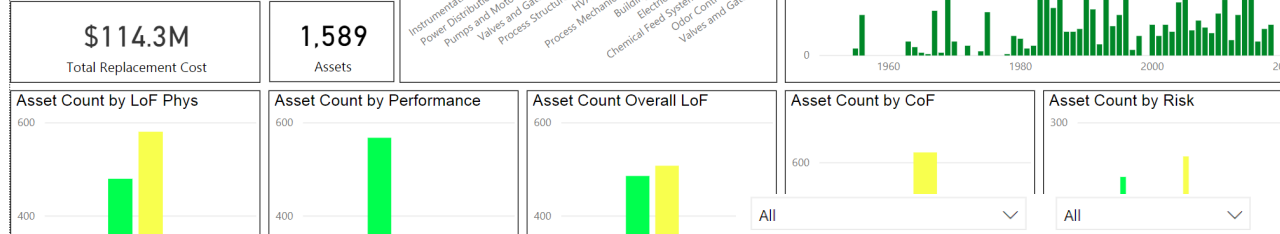
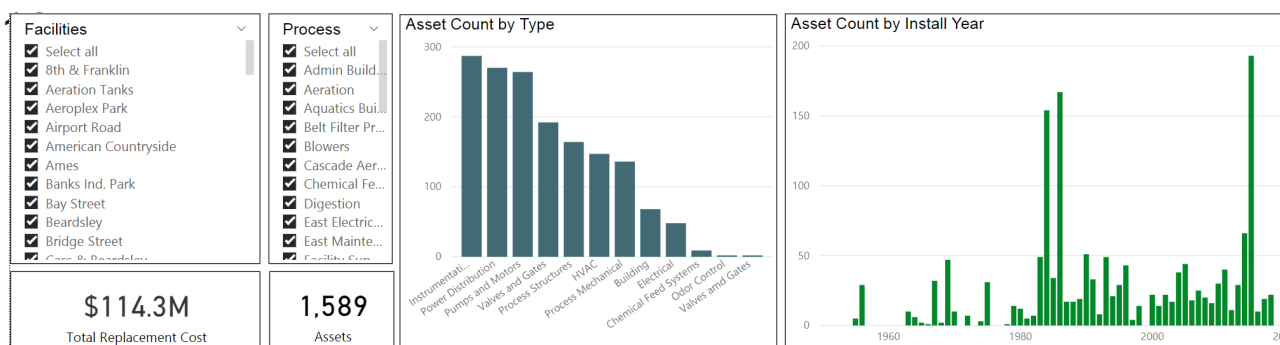


360° Imaging

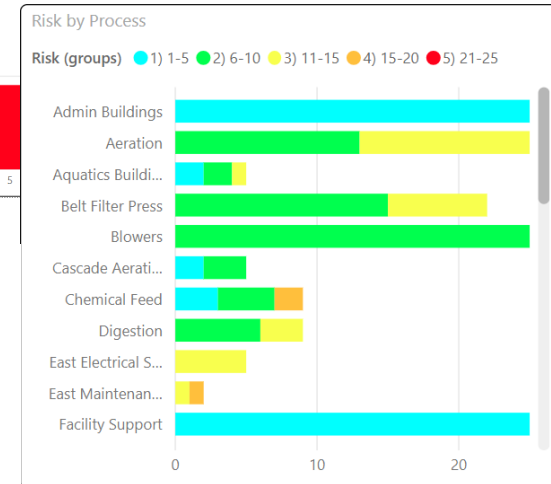


WWTP 360° Imaging

Defensible Vertical Capital Planning

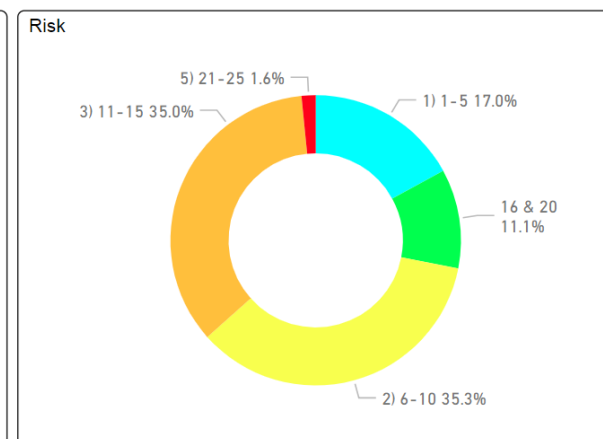


- ## Apply Predictive Maintenance Techniques
- Vibration
 - Thermography
 - MCA
 - Oil Analysis



Risk Matrix

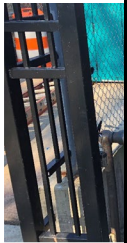
LoF CoF	1	2	3	4	5	Total
5	1,491	1,493	1,861	1,099	496	6,440
4	887	865	1,215	1,385	1,028	5,380
3	650	1,472	2,337	2,835	5,226	12,520
2	306	1,042	1,367	1,298	2,387	6,400
1	82	119	229	179	431	1,040
Total	3,416	4,991	7,009	6,796	9,568	31,780



Process	Asset Type	Asset Name
Facility Support	Sump Pump	Sump Pump 1, RAS Basement
RAS	Pump	Pump 1, Make Up Water
RAS	Pump	Pump 2, Make Up Water
Aeration	Flow Meter	Mag Flow Meter, PE Flow, Aeration Tanks 1 & 2
RAS	VFD	VFD 1, Motor Start 1 & 2, RAS Pumps
RAS	VFD	VFD 2, Motor Start 3 & 4, RAS Pumps
Pumping	Pump	Pump 2, Digested Sludge
RAS	Pump	Pump 3, RAS
WAS	Pump	Pump 4, RAS
Facility Support	Crane	Crane 2, Belt Filter Press 1 and 3, West Monorail
Pumping	Pump	Pump 1, Digester Circulating
Pumping	Pump	Pump 2, Digester Circulating
Pumping	Utility Meter	Utility Meter and CT cabinet
Aeration	Flow Meter	Mag Flow Meter, PE Flow, Aeration Tank 5
Aeration	Flow Meter	Mag Flow Meter, PE Flow, Aeration Tanks 3 & 4
Pumping	Control	Pump Starter/Control Panel, Emergency Dewateri...

Highest Risk Pipe Modeling

Chu



Sim
Water
B

Elementary S



Legend

Flood Depth

< 1/4 inch	1 - 2 ft.
1/4 inch - 1 inch	2 - 3 ft.
1 - 3 inch	3 - 4 ft.
3 - 6 inches	> 4 ft.
0.5 - 1 ft.	



Analytics 101

Machine Learning: Make Better Decisions

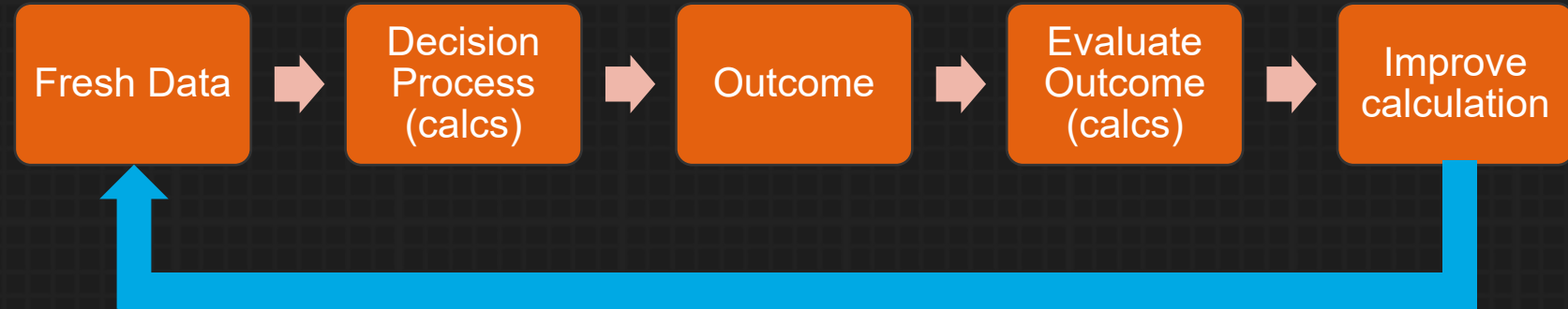
WHAT & HOW

Make ongoing decisions based on a data stream

Many algorithm and software platforms

BENEFIT

Improve decision making over time for various benefits

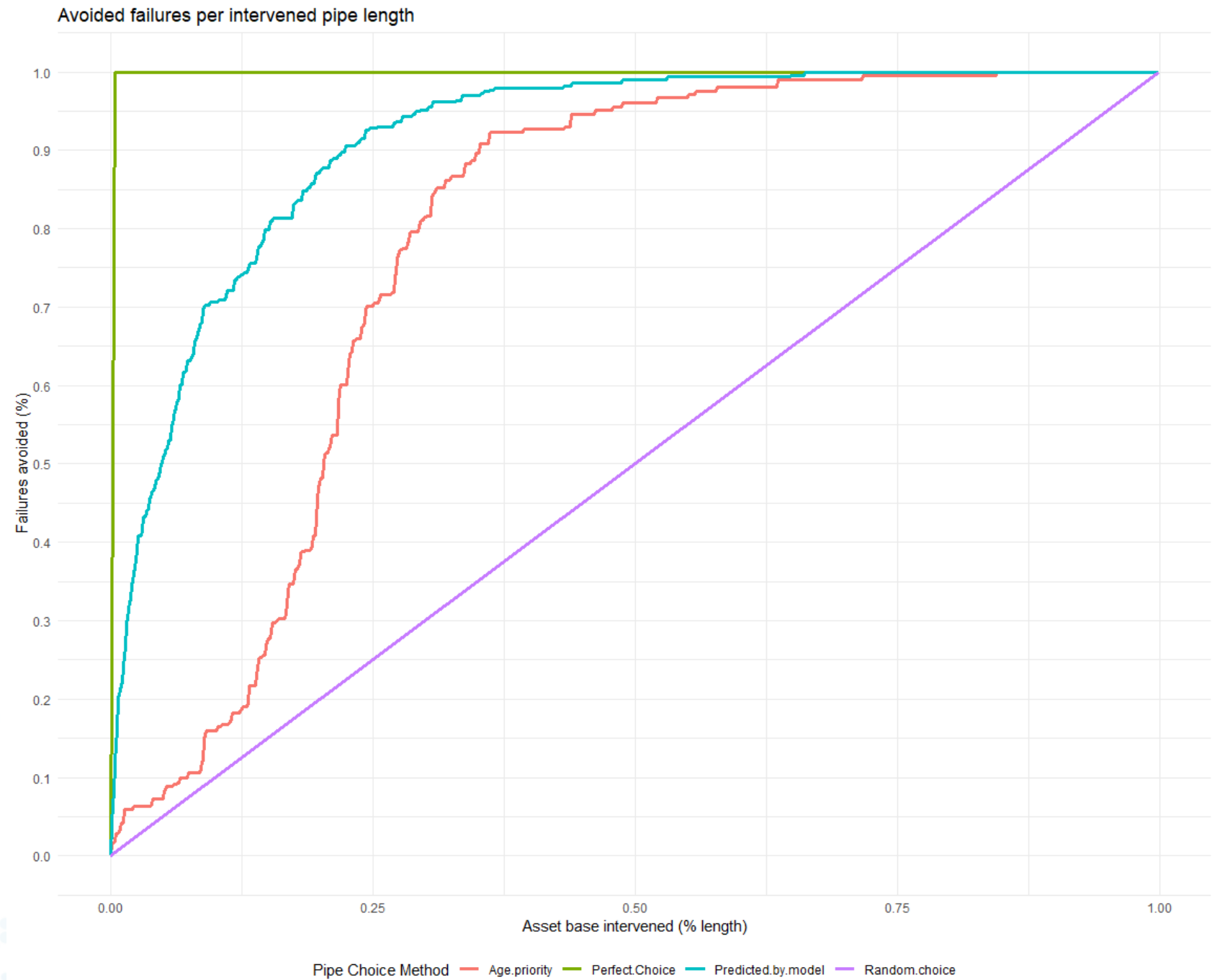


Intelligent Water 101:
Key terms

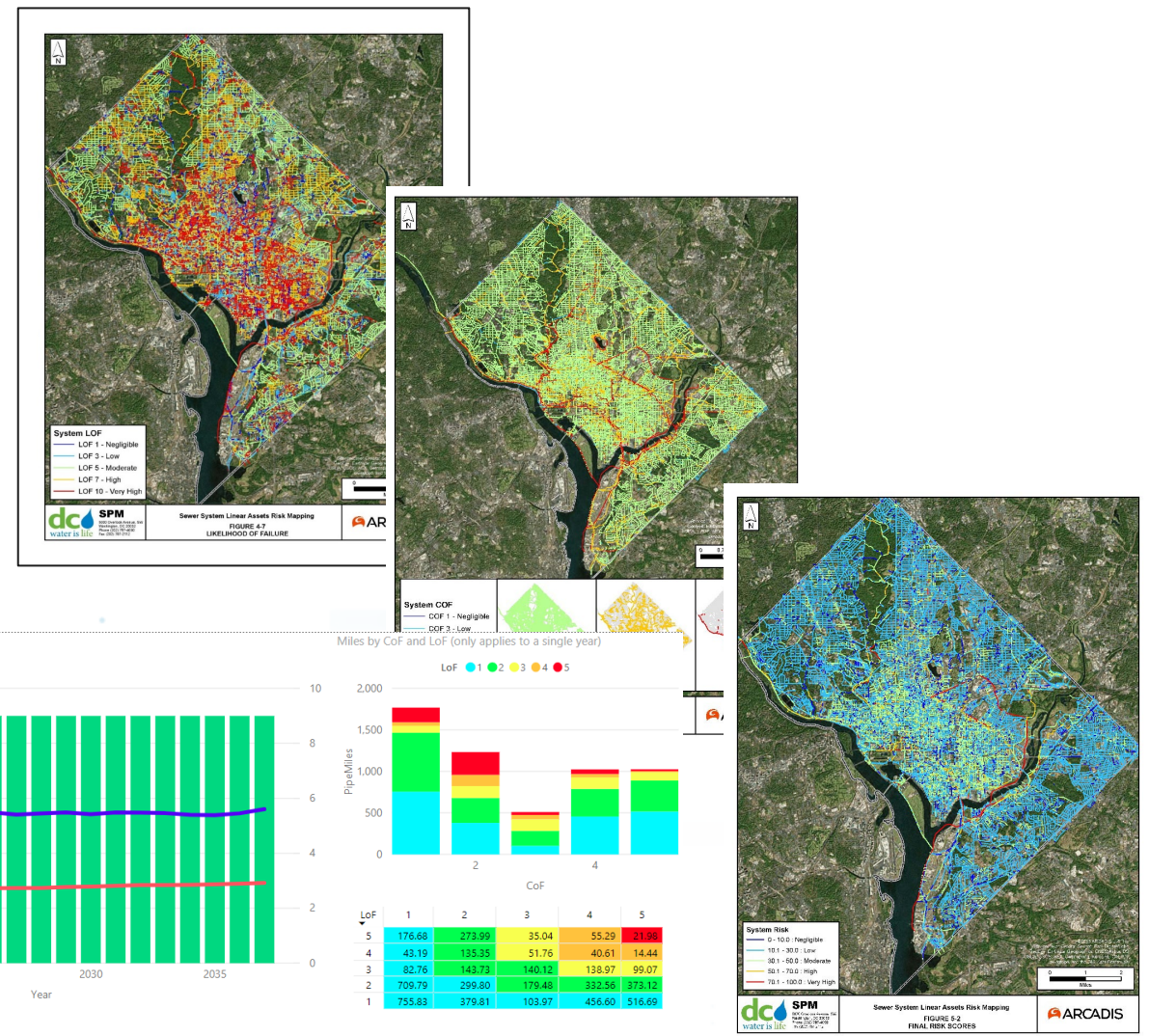
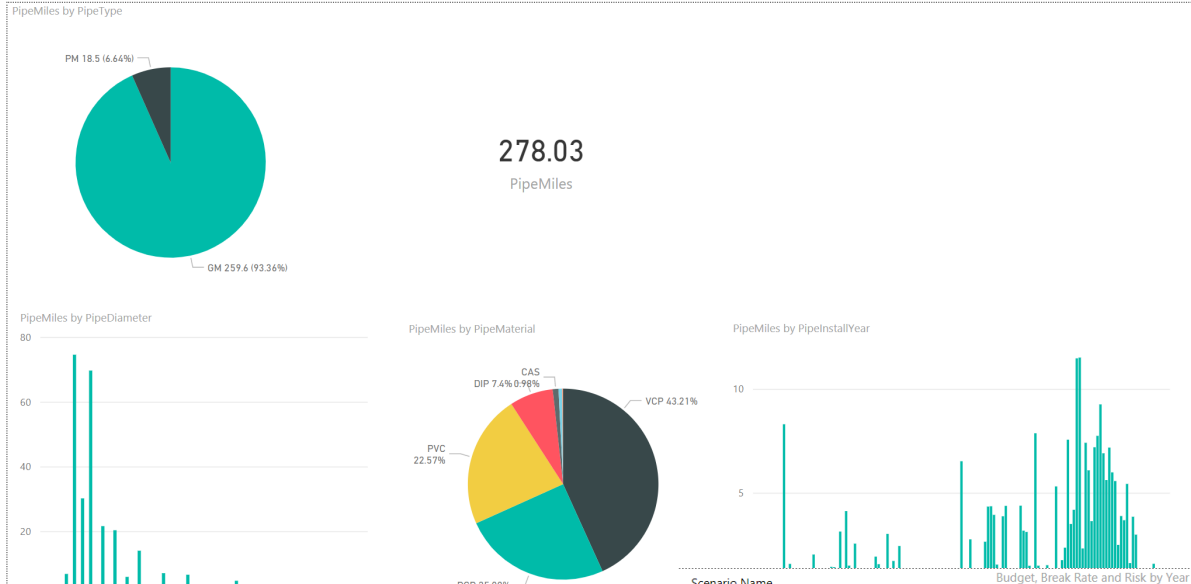
Machine Learning

The ability to improve processing results from experience for a specific need.

Better Results



Defensible Capital Planning

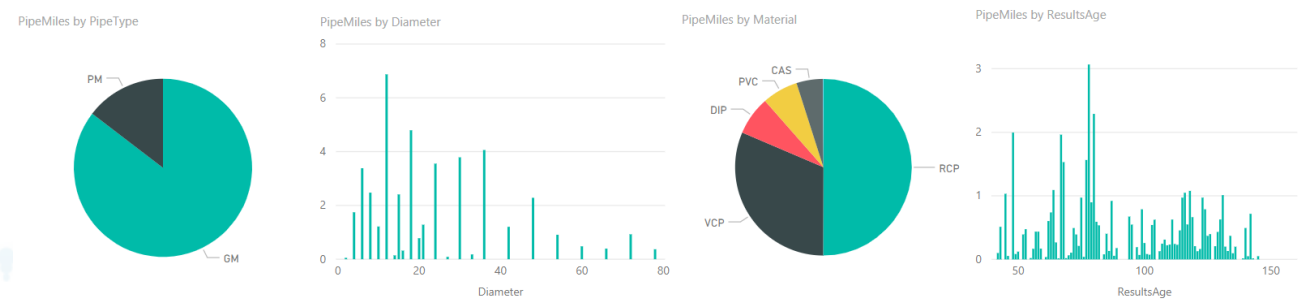
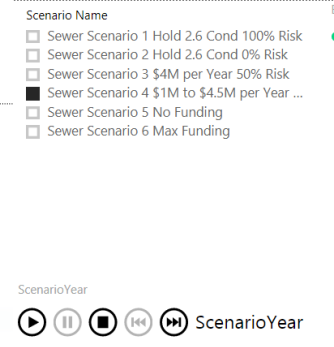


Apply ML to Improve Lof

- Improved Failure Prediction
- Leverage Model and Maintenance

Ties to Levels of Service

- System-wide Risk
- Failure Rate
- Reinvestment Rate





Analytics 101

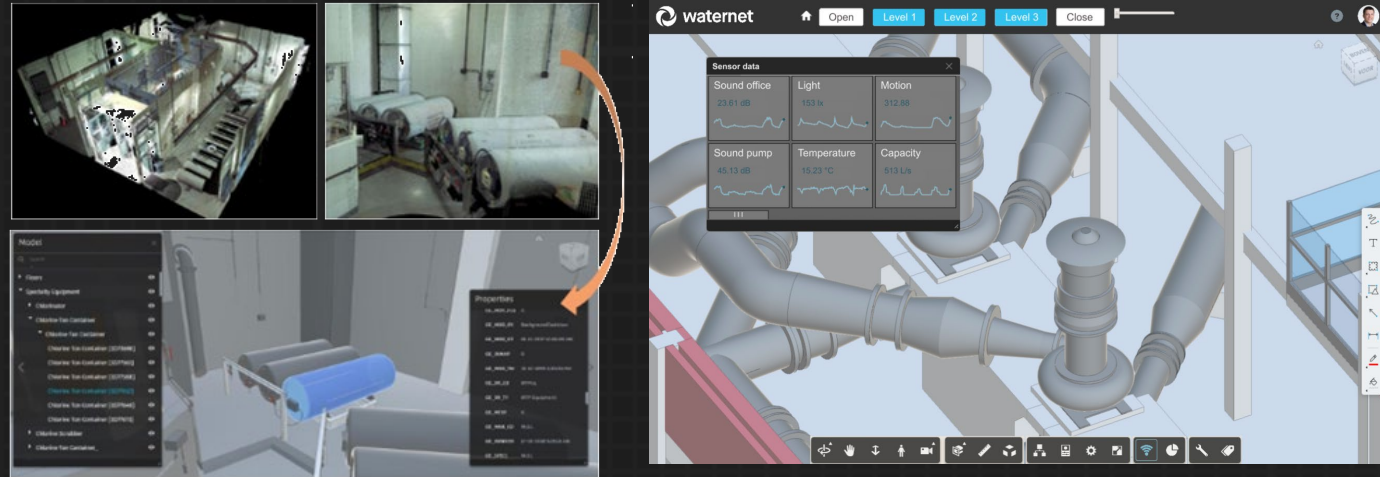
Digital Twin: A Way of Working

WHAT & HOW

Multiple levels

Starts with a virtual representation of an asset

Many types of digital twins



BENEFIT

Enhanced Management of Assets

Improved Workforce Safety & Enablement

Fit-for-Future Monitoring



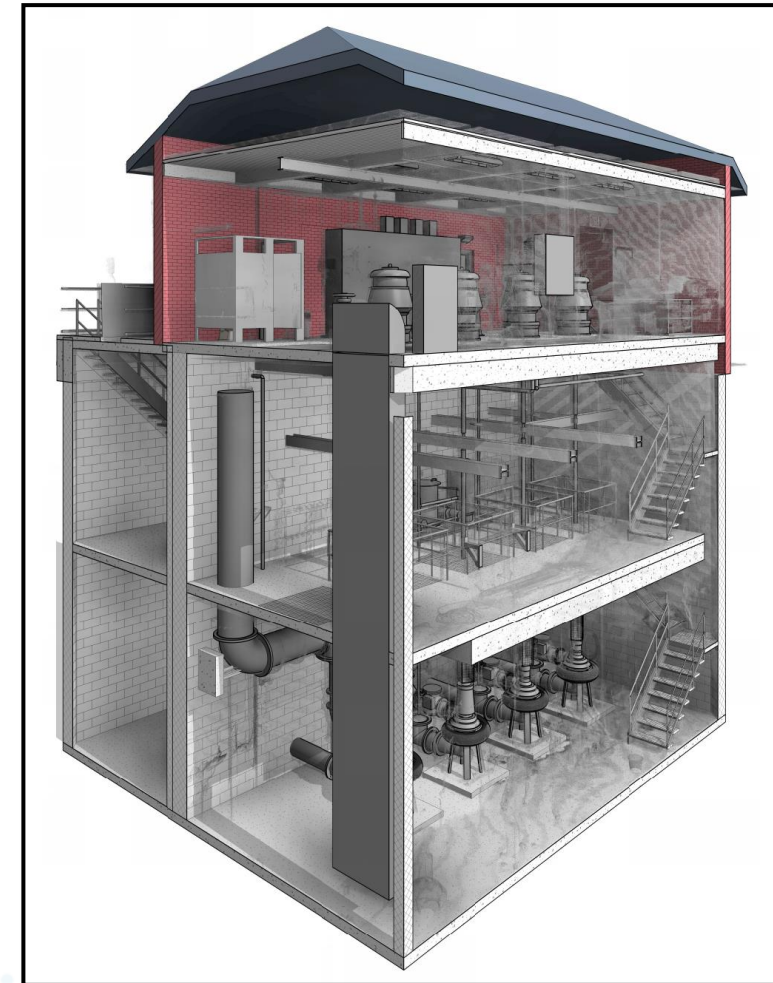
Intelligent Water 101:
Key terms

Digital Twin

Interoperative services that can function together to deliver an immersive environment to plan, analyze, design, construct, operate, and maintain an asset throughout its lifecycle.

3D Scanning

- Single scanner can complete scan of entire building in a day.
- Scanning Process
 - Number of scans per room is based on size and amount of equipment or conflicts
 - Scanning equipment cannot see through equipment
 - The greater the quantity of scans the greater the quality of scans
- Captures down to 1" or smaller (conduit, small diameter piping)



Facilities

All

Areas

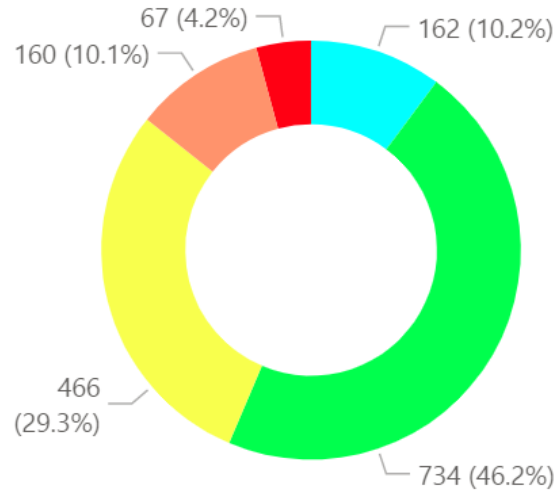
All

Processes

All

Risk

● 1) 1-5 ● 2) 6-10 ● 3) 11-15 ● 4) 16-20 ● 5) 21-25

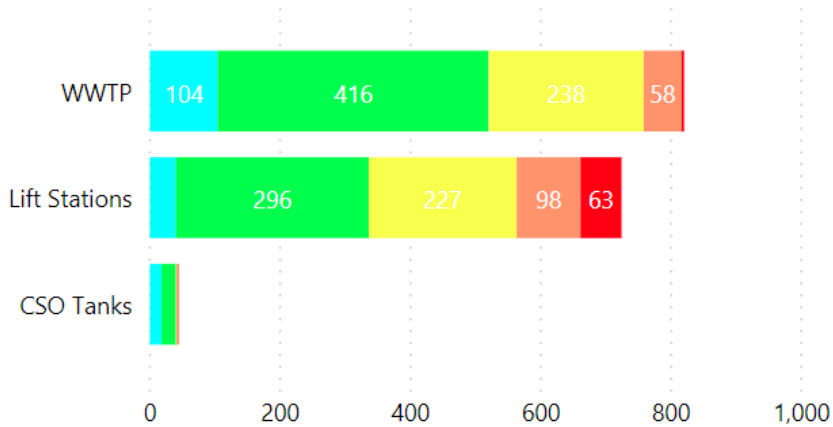


Risk Matrix

LoF CoF R	1	2	3	4	5	Total
5	2	101	120	32	67	322
4	3	59	79	52	76	269
3	9	153	197	123	144	626
2	7	89	89	55	80	320
1	8	17	15	5	7	52
Total	29	419	500	267	374	1589

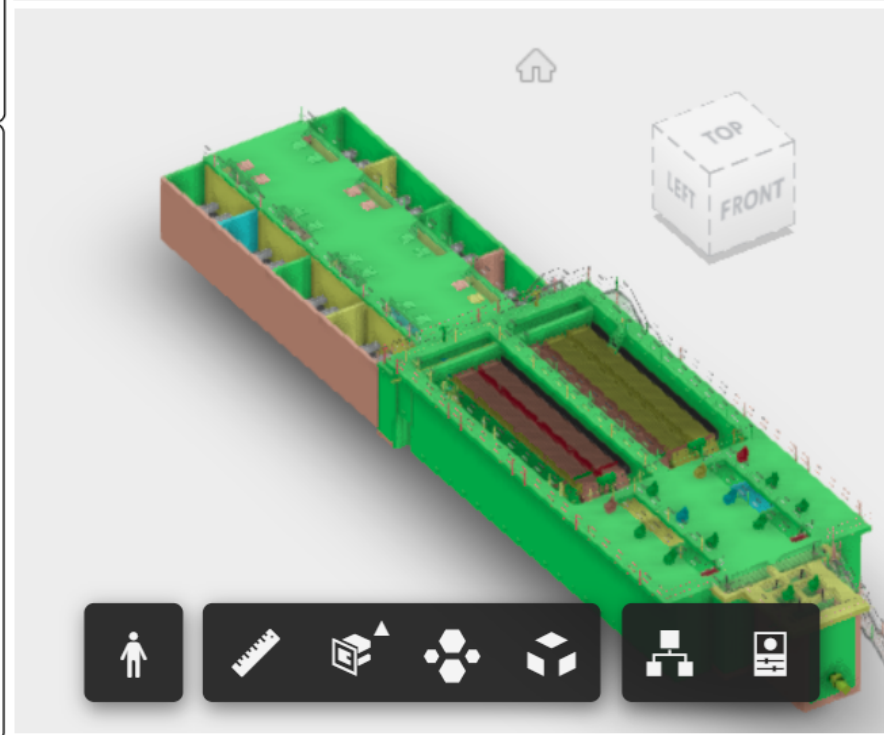
Assets by Facilities and Risk

Risk ● 1) 1-5 ● 2) 6-10 ● 3) 11-15 ● 4) 16-20 ● 5) 21-25

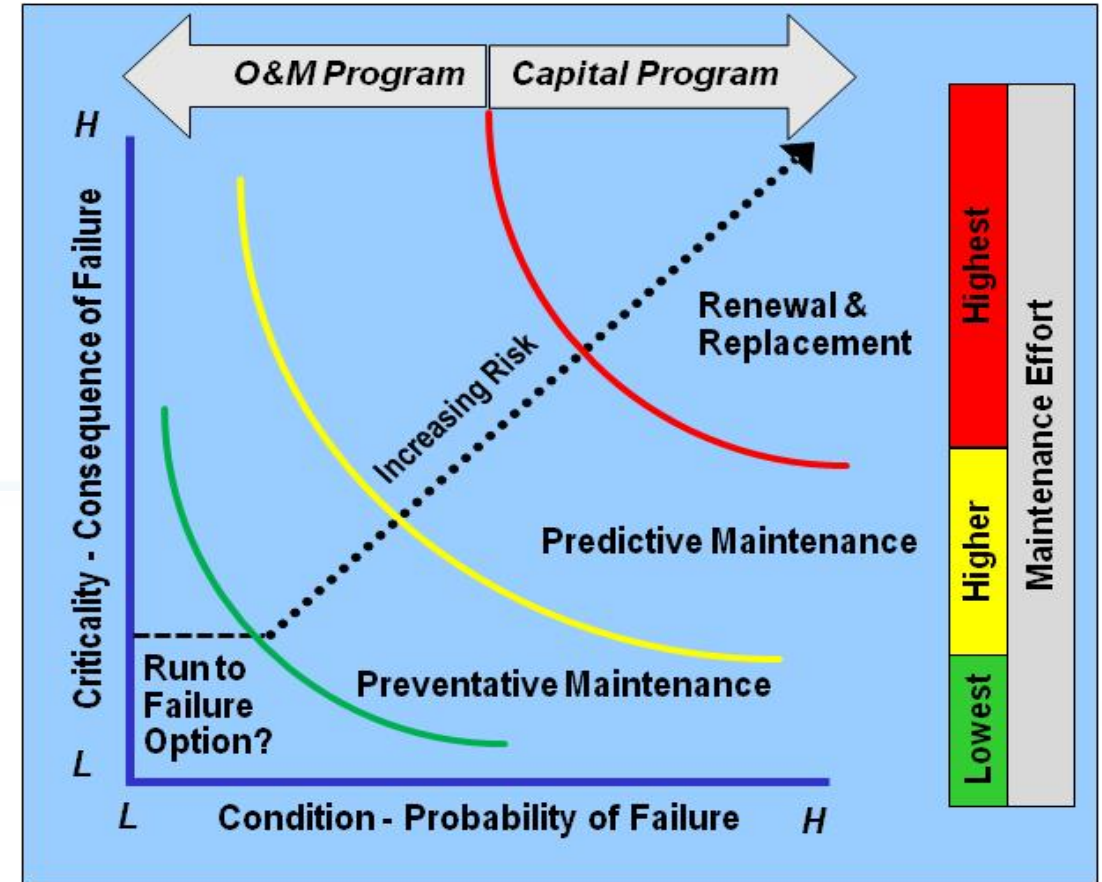
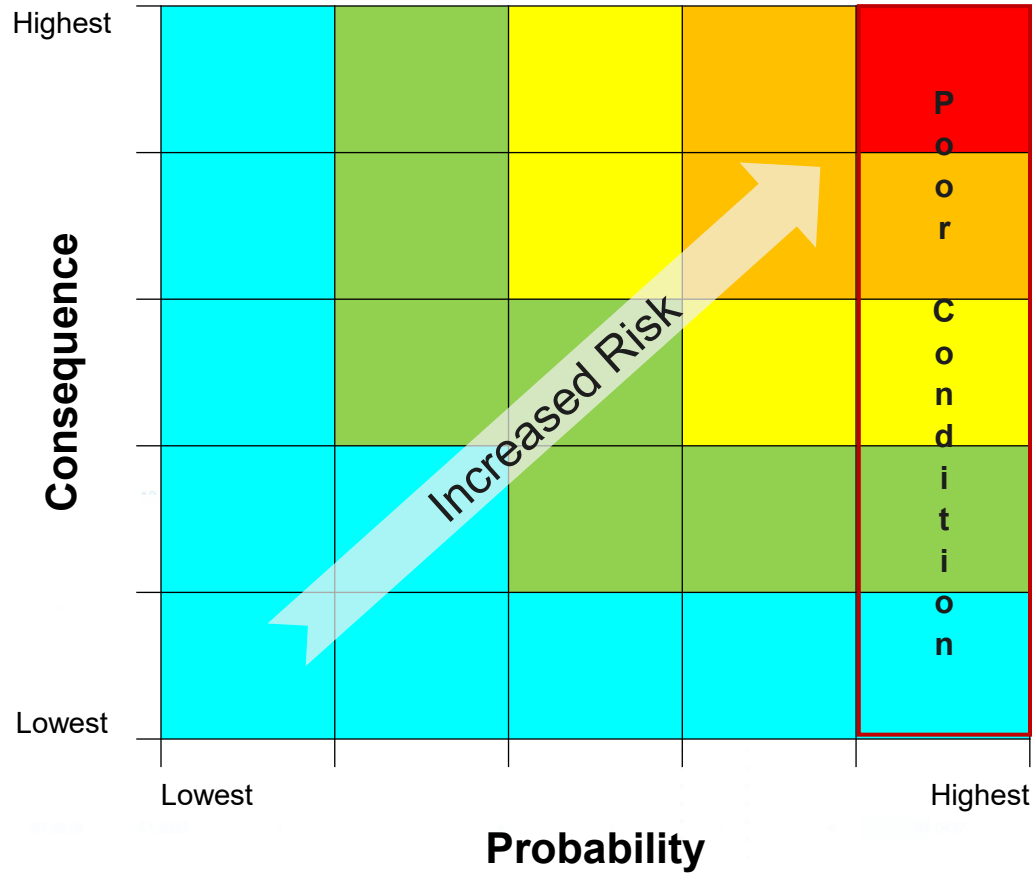


Risk Matrix

Cnt	Asset ID	Facility	Area	Type	Asset Name	Max Perf Factors	Perf	Max Phys Fac
1	20	Lift Stations	Studebaker Park	Control Panel	Control Panel, Pump	Reliability	5	Corrosion, Dielect Leakage, Electrical Damage
1	26	Lift Stations	Studebaker Park	Transformer	Dry Type Transformer	Reliability	5	Corrosion, Dielect Leakage, Electrical Damage
1	49	Lift Stations	Beardsley	Roof	Lift Station Building Roof	Reliability	2	EUL
1	55	Lift Stations	Holly Lane	Tube Structure	Tube Structure	Obsolescence	5	Leakage, Steel Joint Damage
1	77	Lift Stations	Studebaker Park	Valve	Discharge Isolation Valve 2	O&M	5	EUL
1	97	Lift Stations	Lexington	Control Panel	Pump Starter/Control	Reliability	5	Corrosion, Dielect
1589								

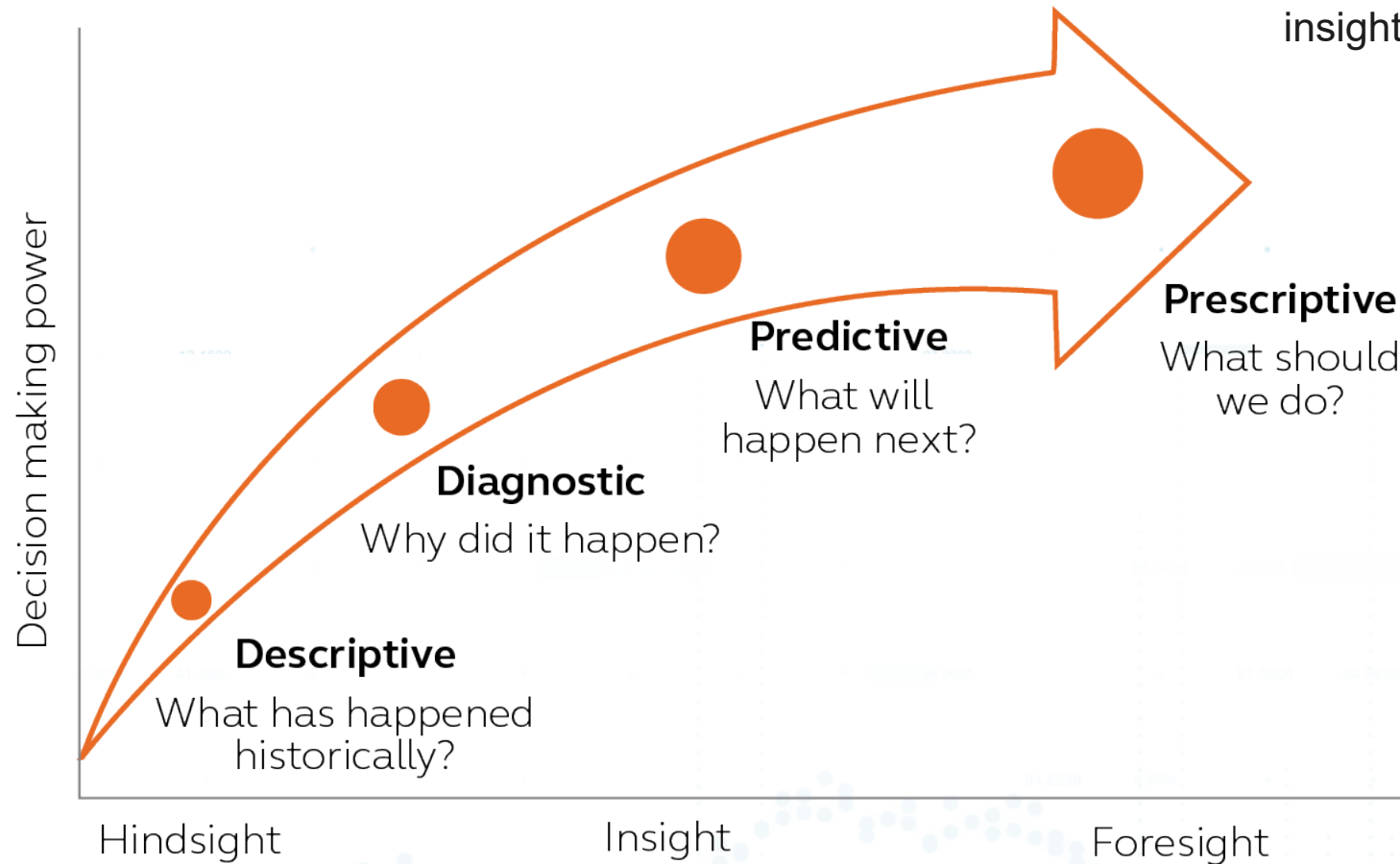


Risk Assessment to Balance Totex



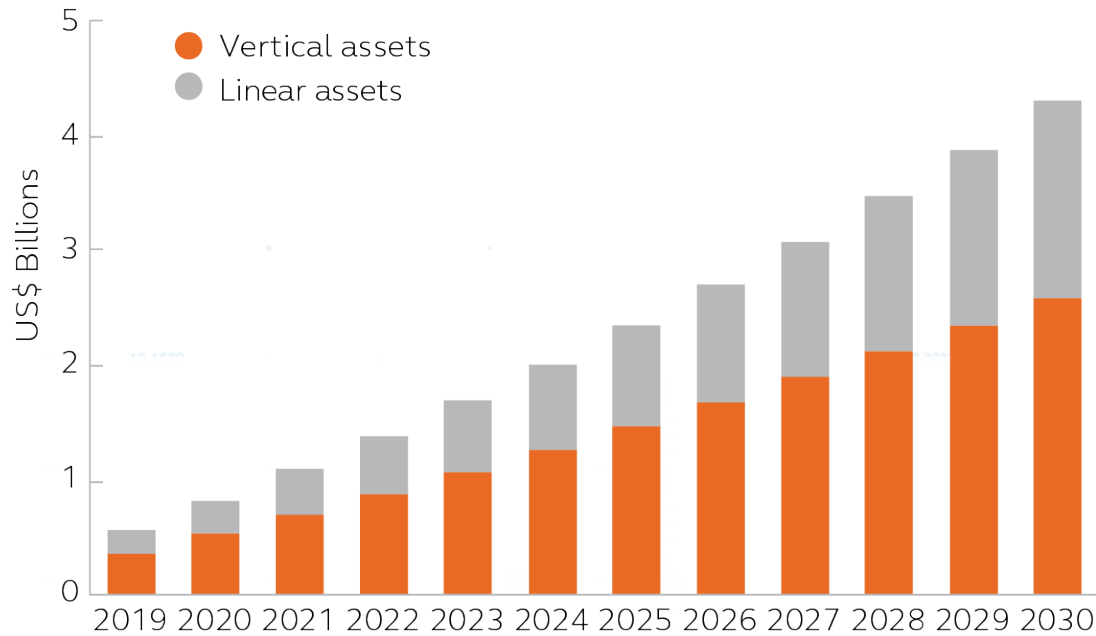
Leveraging Analytics

- Analytics is the use of data to deliver insight & support better decision making
- Analytics is a combination of mathematics & statistics, data techniques and advanced algorithms to quantify and predict performance, risk, condition, service, cost & revenue with rich data visualization to communicate insight



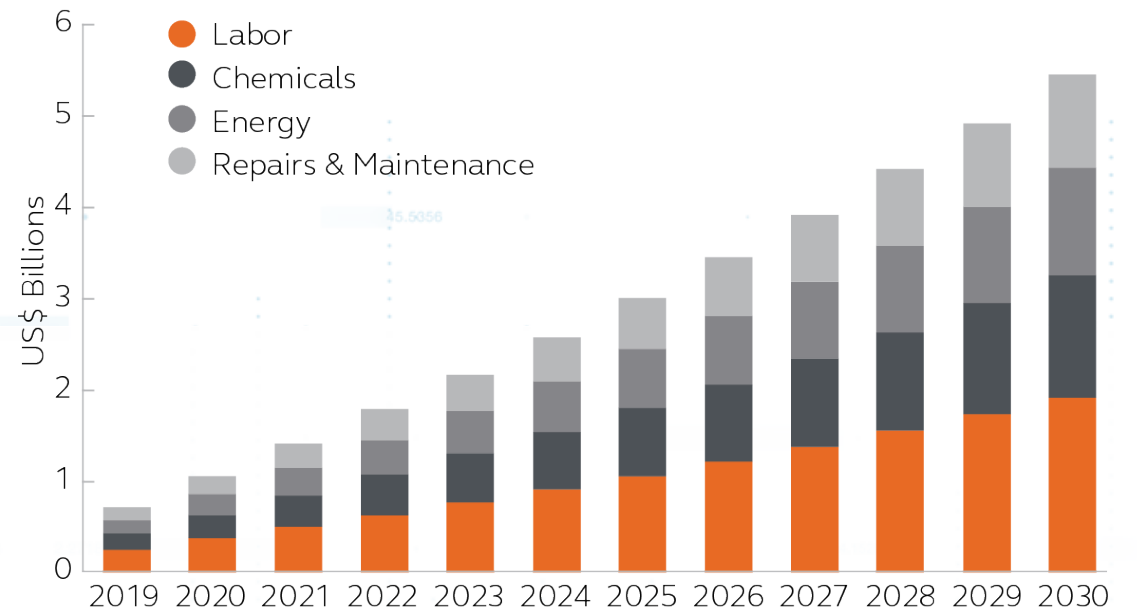
Potential Totex Savings from Advanced AM in US

Advanced asset management CAPEX savings forecast, 2019-2030



Source: Bluefield Research

Advanced asset management OPEX savings forecast, 2019-2030



Source: Bluefield Research

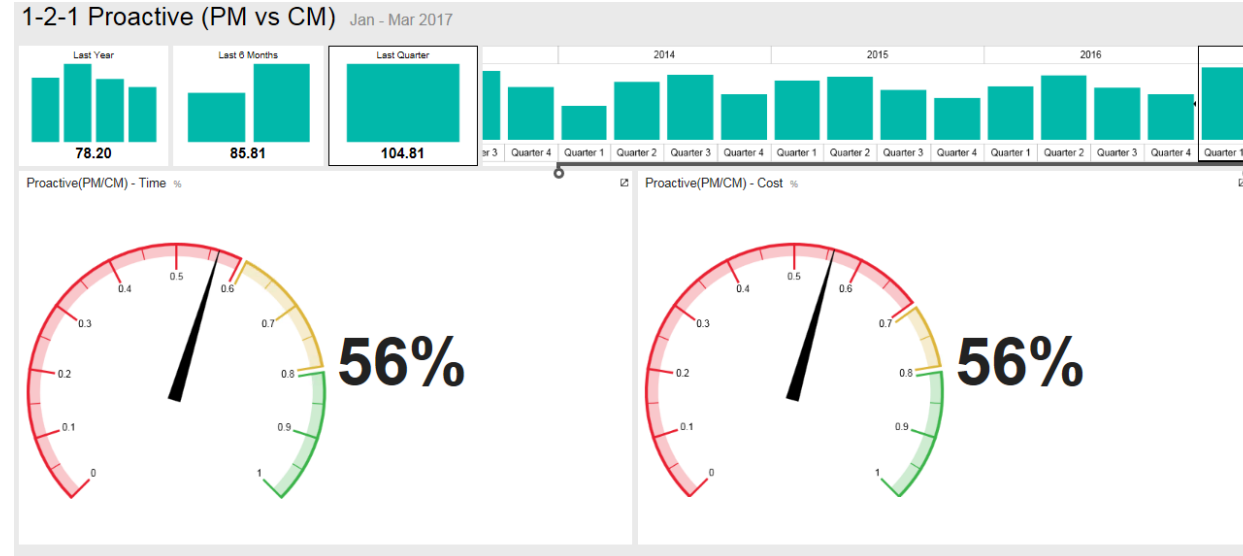
Over 17B in CAPEX alone

Dashboards Provide Internal Information

KPI: % Proactive (PM/CM) - Time

- Formula:
$$\% \text{ Time Proactive} = \frac{\text{Hours Proactive}}{\text{Hours Proactive} + \text{Hours Reactive}}$$
- Data gathering process: CMMS
- Update frequency: Continuously through CMMS. Initial display will be quarterly, with ability to provide a specific time frame
- Historic data requirements: 4-5 years
- Target: WERF 2014 Research Report "Leading Practices and Key Performance Indicators for Asset Maintenance" cites Toronto Water as best practice case study: Their goal is 75% planned to 25% unplanned work orders.
- Drill-down capabilities for PM vs CM by location and Supervisor.
- Visualization type: Radial for the top level, and then scorecard for next level

Top Level



1-2-1 Proactive Time Details APORTALES, 1004

PM vs CM by Supervisor Hours				PM vs CM by Location Hours			
Category	PM Hours	CM Hours	Score	Category	PM Time	CM Time	Score
APORTALES	641.50	442.25	▼	1004	3	0	▼
BBUTLER	172	19	▼	1102	1	0	▼
BILL675	166	43.50	▼	1180	2	0	▼
BOWENS	107	0	▼	1425	1	0	▼
BSTEWART	451	327	▼	1432	3	0	▼
CARLOS613	1,268	245	▼	1453	3	0	▼
CGRIFFIN	331	426	▲	1458	1	0	▼
DHAYES	1,068.50	385.50	▼	1459	7	5	▼
DMOBLEY	312	417.50	▲	1467	6	0	▼
FMONTIS	44.50	27	▼	1504	2.50	0	▼

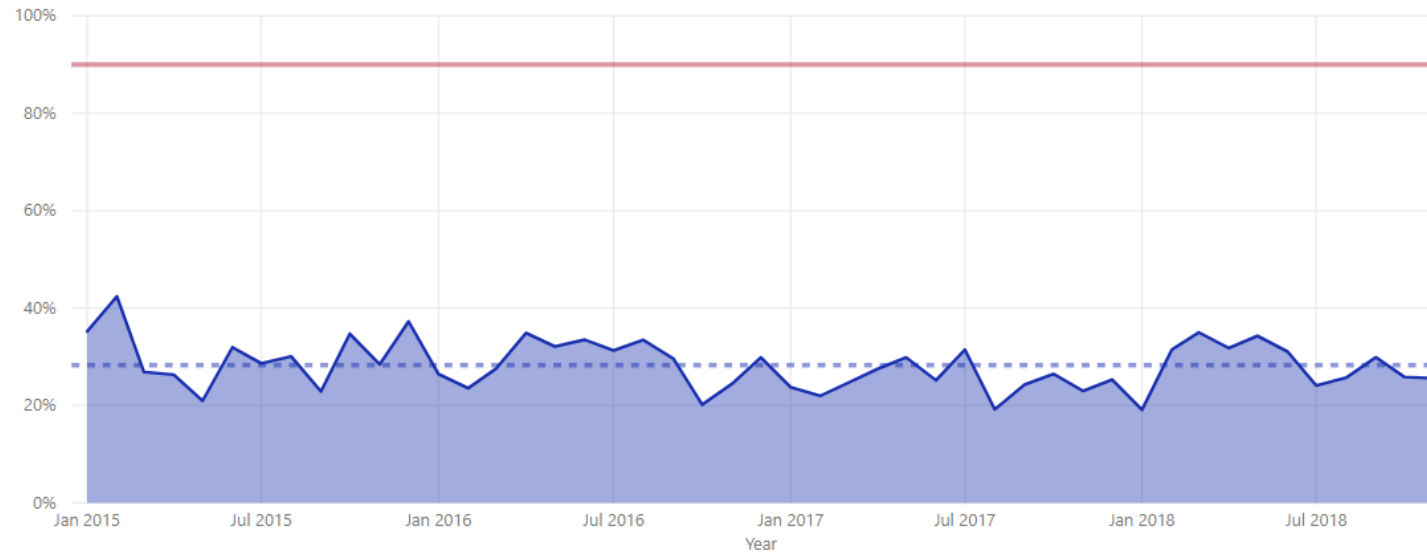
Business Visualization

Are We Meeting Our Prev. Maintenance Targets?

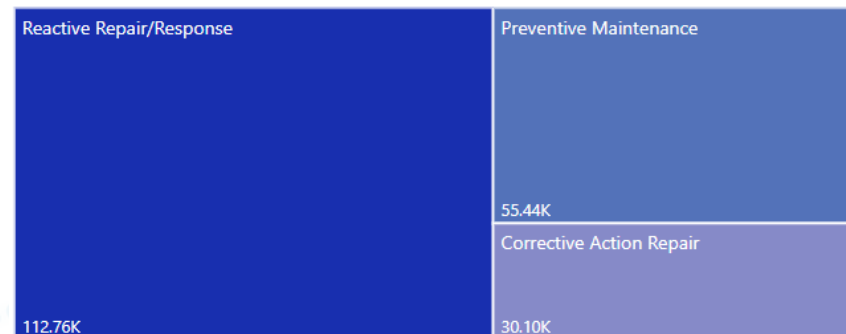
Lucity CMMS Performance

Planned Maintenance Percentage

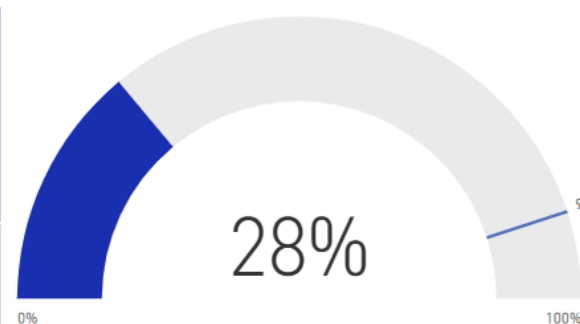
Planned Maintenance Percentage (Percentage of Preventive Maintenance Labor Hours) over Time



Labor Hours by Reason



Planned Maintenance Percentage



Reason	Workorders	Average Hours
Repair	1	175.00
Investigate	1	175.00
Corrective Action Repair	5576	5.47
Mainline Replacement	3	113.33
Mainline Blockage	1	30.00
Flow Restriction	1	24.00
Damaged Handrail	1	23.00
Water Shutdown	22	21.41
Erosion	9	17.50
Sunken Trenches	2	17.00
Valve Broken	17	16.90
Wet Weather Event	1	16.00
Drive Chain Loose	3	14.33
Water Quality Free Chlorine	1	14.00
Wet Tap NOB	1	14.00
Debris	45	13.18
Building Modification	37	13.00
Blockage	66	11.60
Meter Lid Damaged	6	11.00
Equipment Not Running	24	10.48
Broken Mainline	5	10.30
Low Chlorine	4	9.63
Establish Potable Service NOB	3	9.50
Fading	2	9.50
System Interruption	3	9.33
Corrosion	15	9.13
Unable To Cut Off	9	9.03
Infiltration	10	8.95
Low Water Pressure	18	8.82
Sunken MH	7	8.79
Excessive Vibrations	16	8.78
Total	62327	3.20

Business Visualization

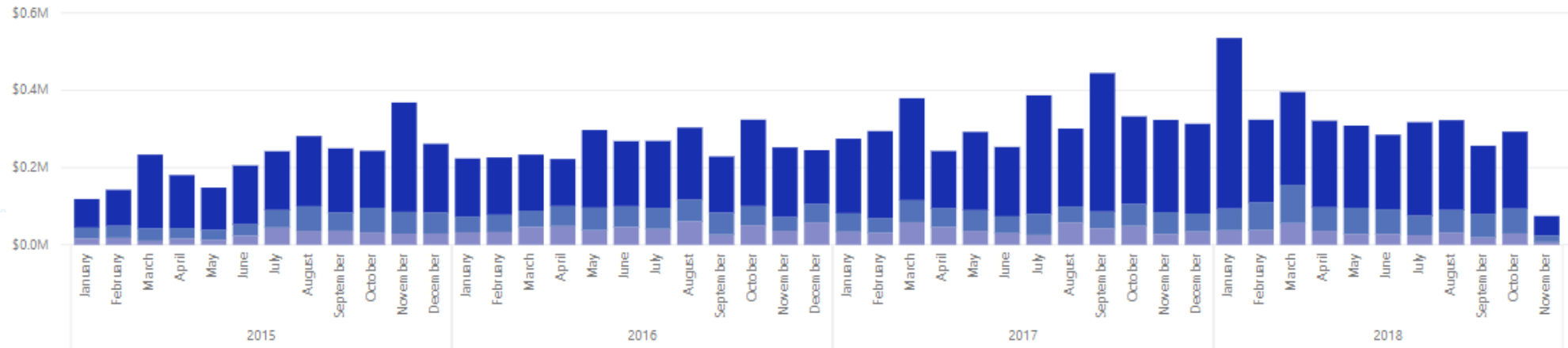
What Assets Consume Our O&M Dollars?

Lucity CMMS Performance

Work Order Cost

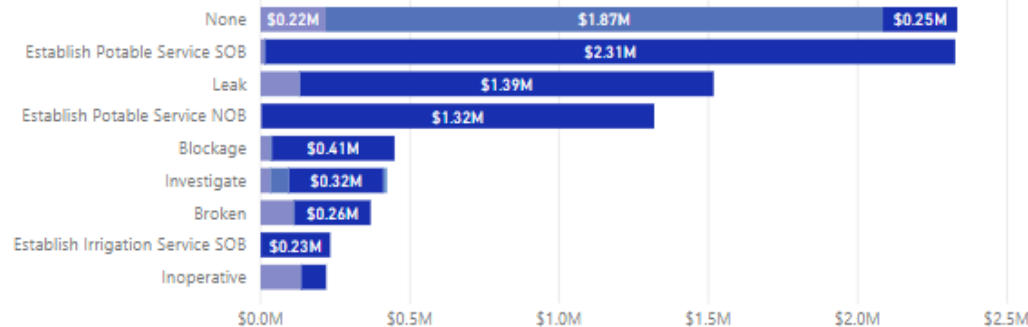
Work Order Cost Over Time

Reason ● Corrective Action Repair ● Preventive Maintenance ● Reactive Repair/Response



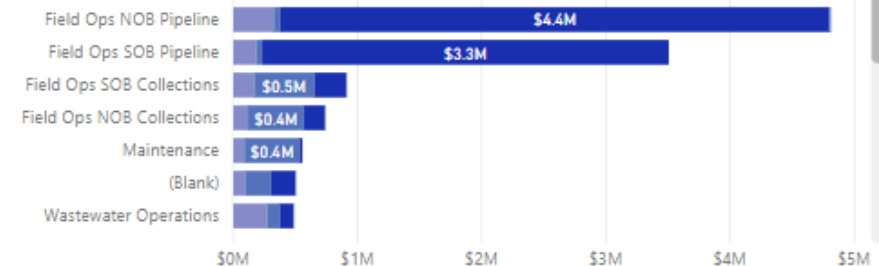
Work Order Cost by Problem Type

Reason ● Corrective Action Repair ● Preventive Maintenance ● Reactive Repair/Response ● Repair

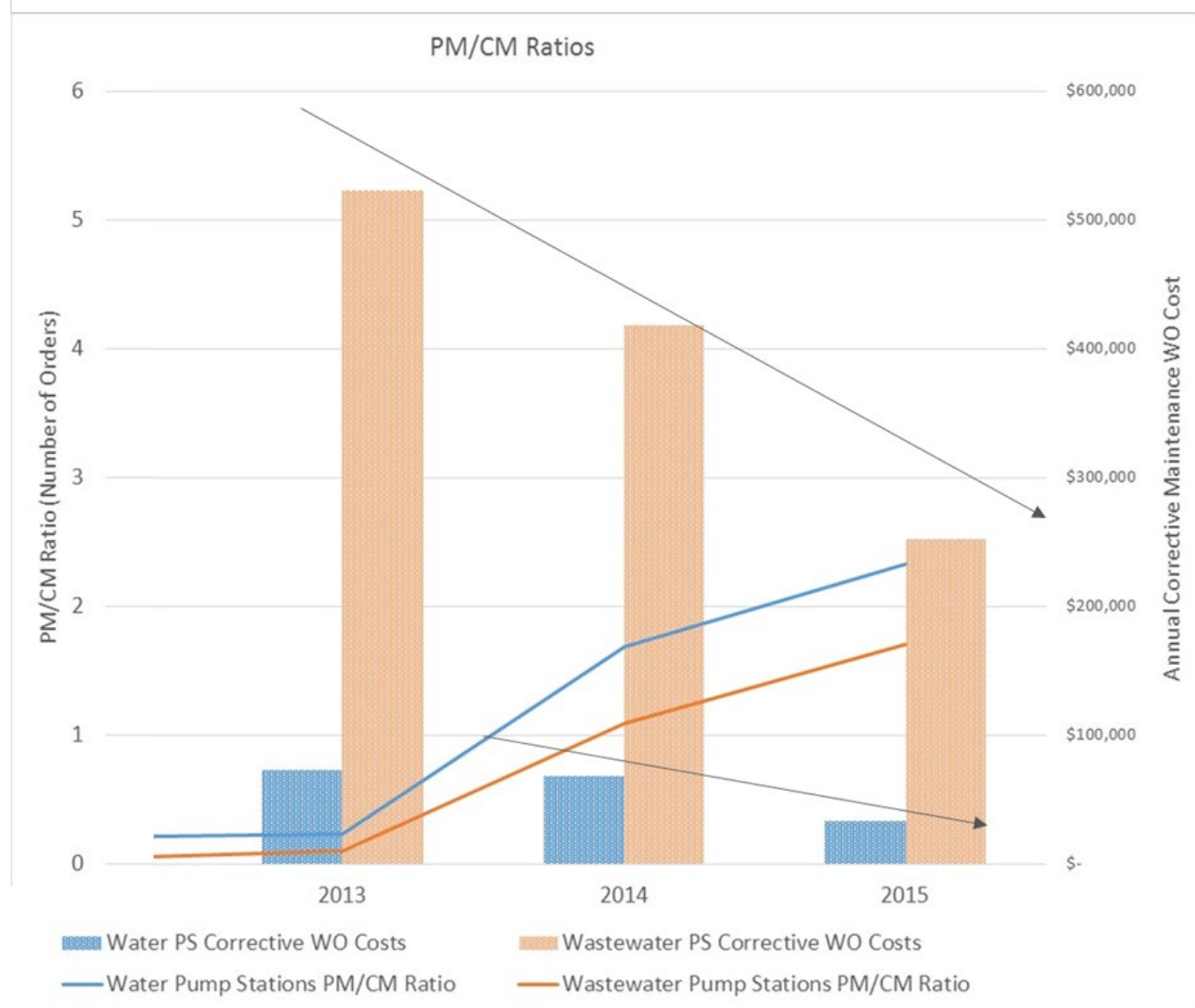


Work Order Cost by Department

Reason ● Corrective Action Repair ● Preventive Maintenance ● Reactive Repair/Response ● Repair

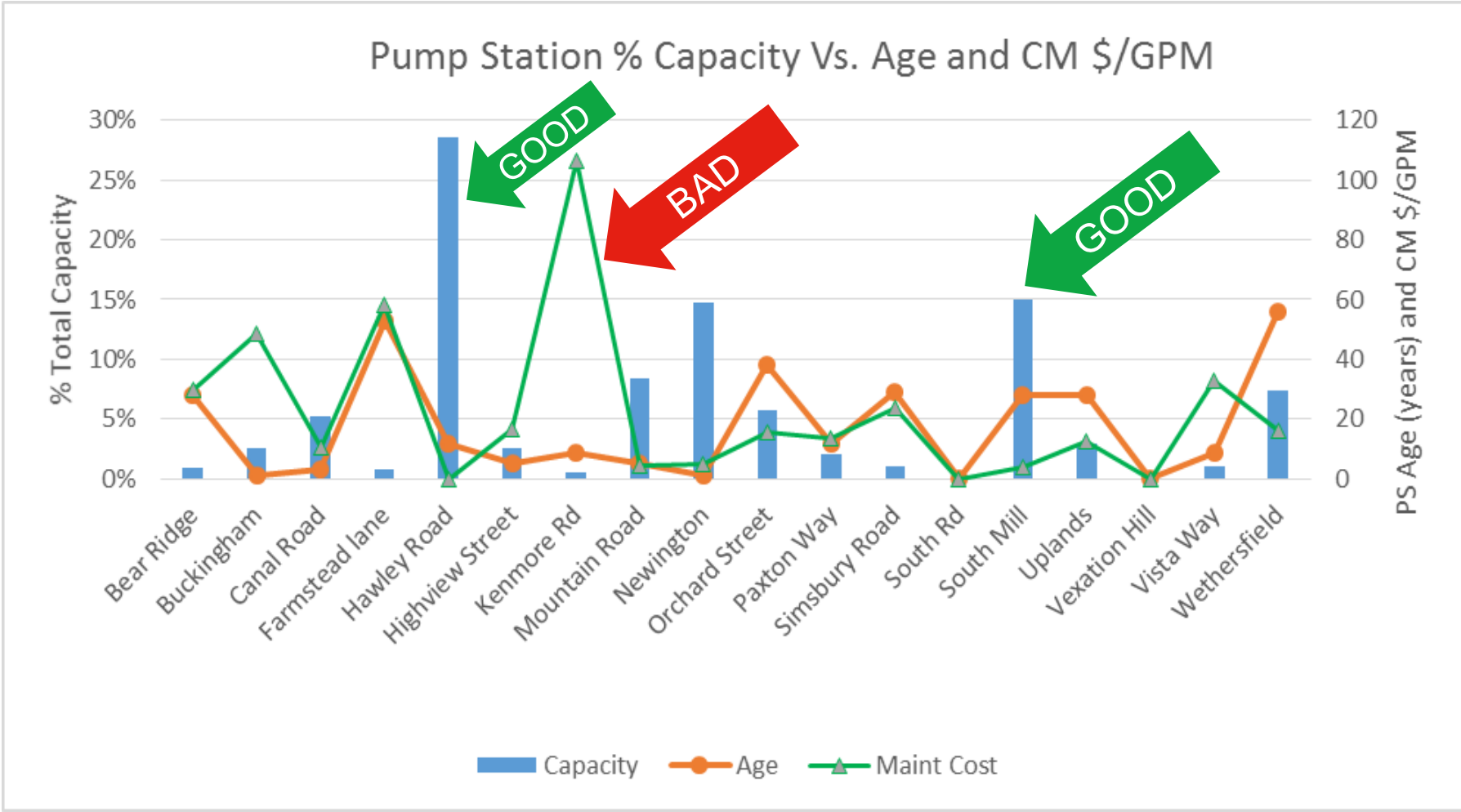


50% Reduction in Pump Station Corrective Maintenance Cost



- PM/CM is an effective leading indicator
- CM costs fell sharply as PM/CM ratio increased
- CM cost fell almost 50% in three years

Maintenance Lagging KPIs Inform CAPEX Planning



Dashboards Support Data Gathering for Decision Making

LOS: Maintain or improve water system current asset system-wide condition and risk

KPI Lagging: Percent of Work Orders completed

KPI Leading: Pipeline inspection program completion

KPI 4-1-5A: Pipeline Inspections

Year
2017

Inspection Information

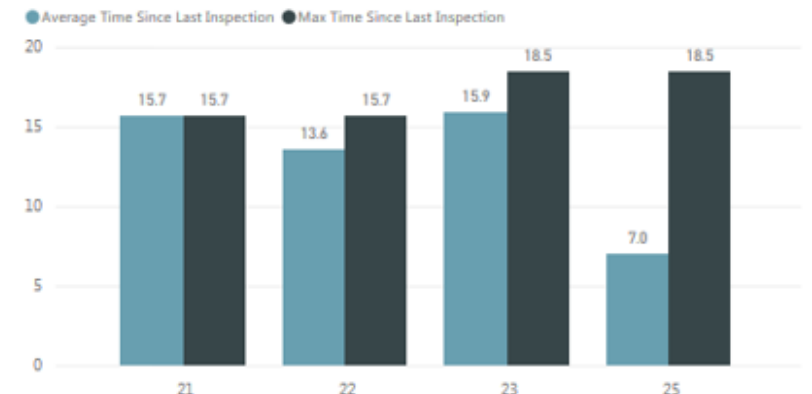


RouteID	Status
11	Red
12	Red
13	Red
14	Green

RouteID	Status
21	Red
22	Green
23	Red
25	Green

Pipelines last inspection status

Inspection Information



Thresholds

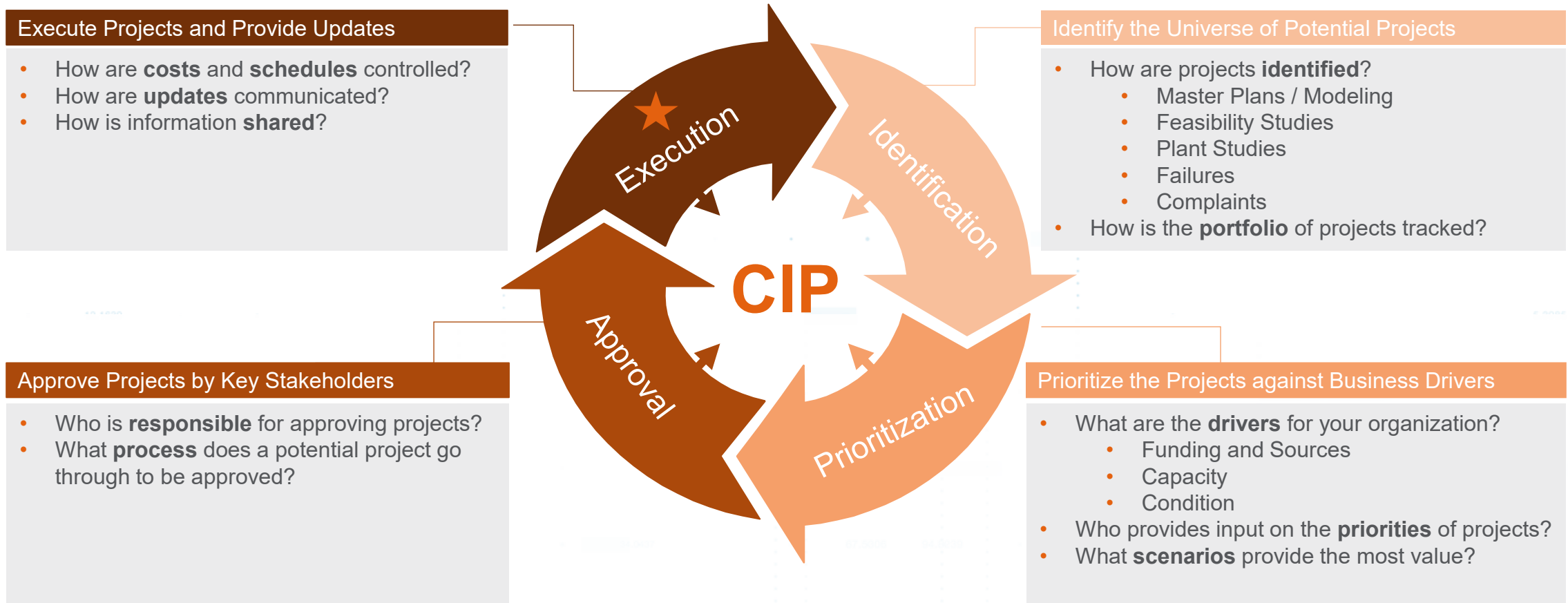
- Average > 10; Max > 15
- Average > 15; Max > 20

Total 13824 32695 42.28 %

Large Program/CIP Management



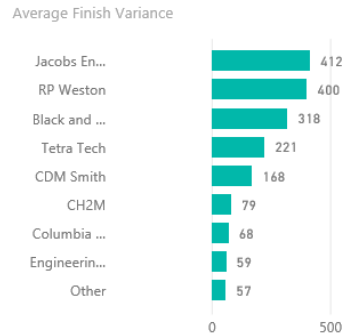
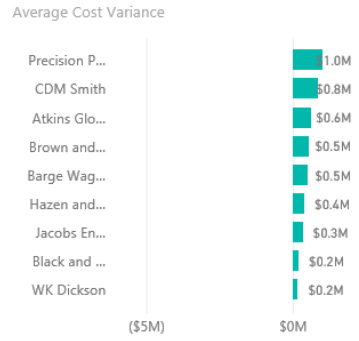
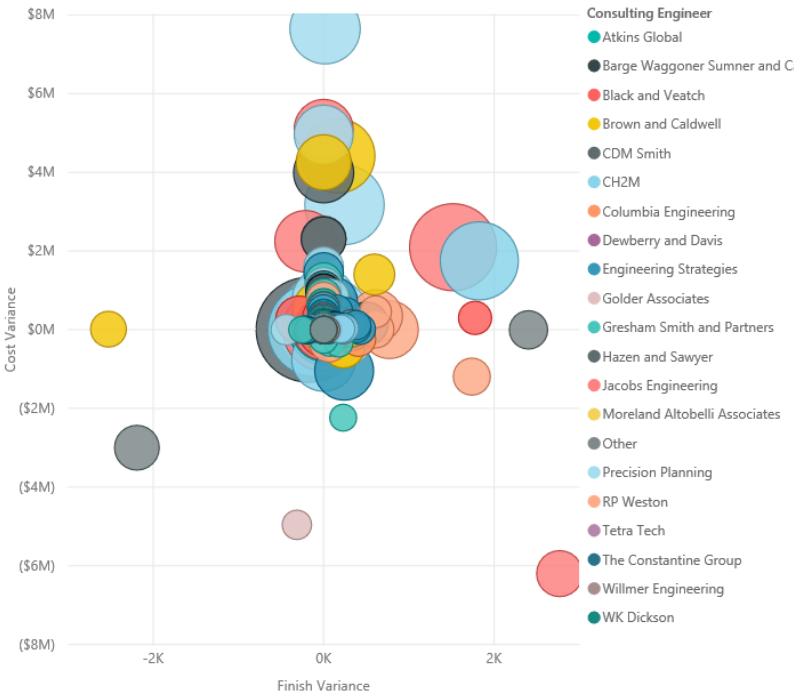
Asset Management to CIP Execution



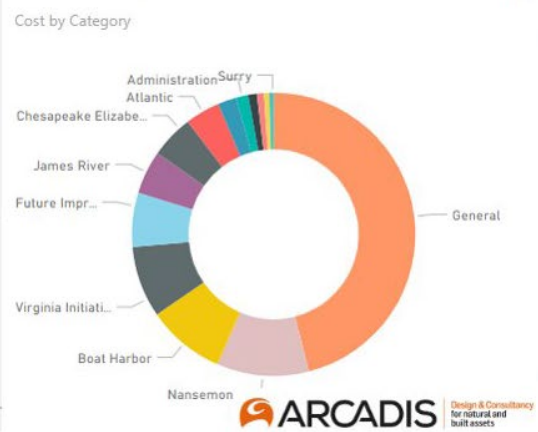
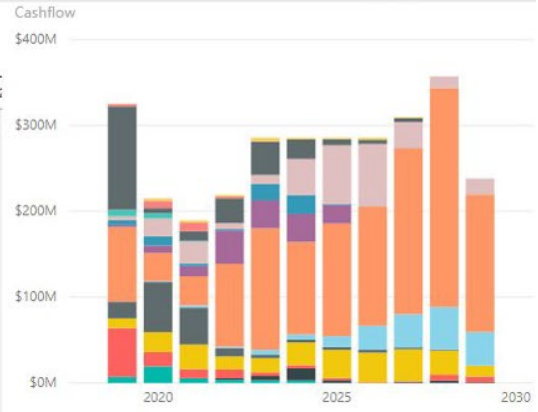
Project Tracking

Variations

Finish:
 Consulting Engineer:
 Status:
 SAP Program Category:
 SAP Project Number:



Project	Cost Variance
F Wayne Hill Operations Building Exp...	\$7,651,983.82
LFP Raw Water Reservoir By-Pass Pipl...	\$5,105,000.00
DWR Central Campus Building Expan...	\$4,960,000.00
Water Production Arc Flash and Grou...	\$4,417,972.00
Lake Lanier Low Pressure Sewer	\$4,255,235.00
FWH DCS to PLC Conversion	\$3,990,232.00
48in PCCP Replacement (Sunny Hill R...	\$3,172,000.00
Duluth Highway WMR Project	\$2,316,156.83
FWH VFD Refurbishment	\$2,299,500.00



What Stakeholders Are Being Impacted?

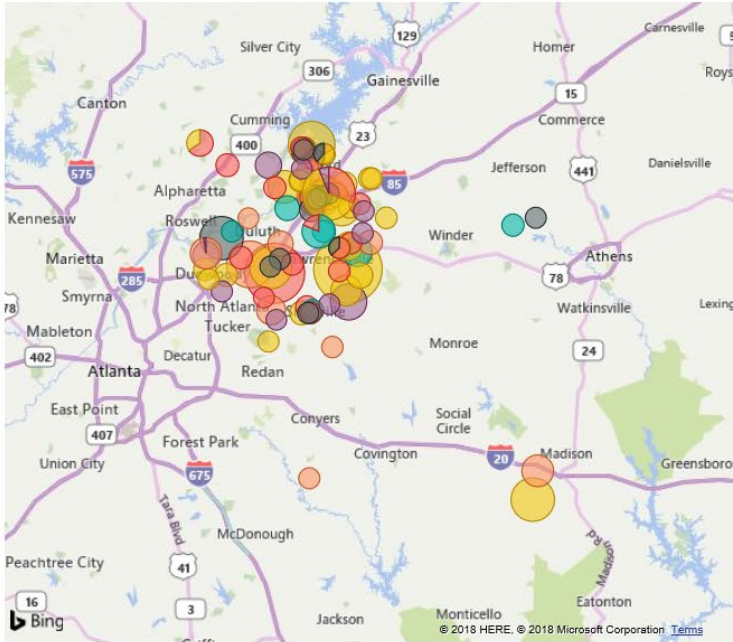
Active Projects

Finish: 7/22/2016 to 1/18/2026

SAP Program Category: All

SAP Project: All

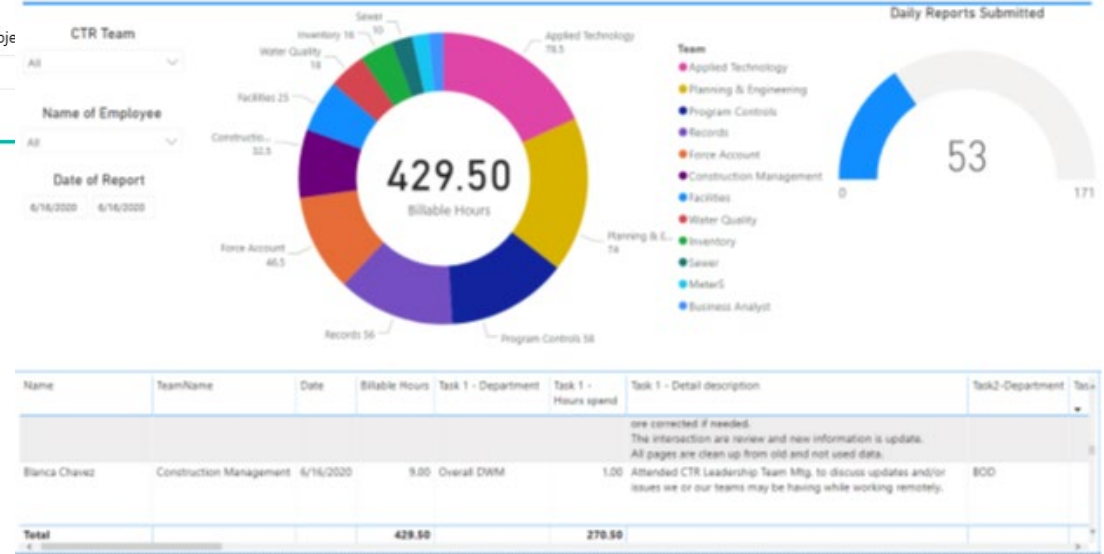
Active Projects



Status: Bid Construction Design Other Pre-Design

2017 City of Peachtree
 Name
 M-1006
 SAP Project Number
 2,555.00
 Duration
 12/29/2023 5:00:00...
 Finish
 Other
 Status
 None Selected
 Demand Service Category
 591
 CIP Fund
 \$236,366.73
 Cost to Date
 None Selected
 Consulting Engineer
 (Blank)
 Contractor
 33.99
 Latitude
 91.00
 Project Quality
 (Blank)
 Estimated Cost - Design

ARCADIS DAILY TASK MONITOR AND WORK ANALYZER



Burn Rate

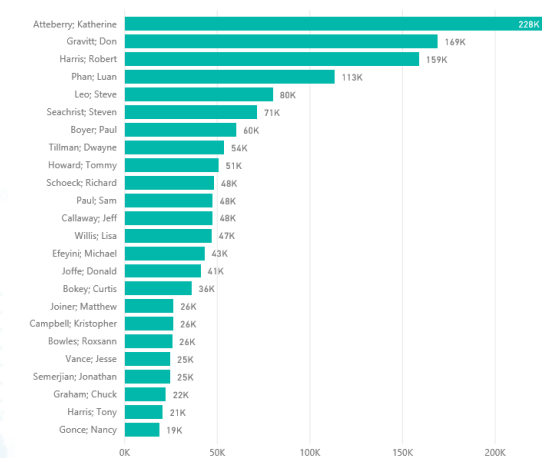
Finish: 7/14/2015 to 1/18/2026

Status: All

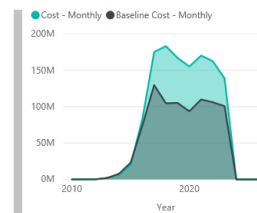
SAP Program Category: All

SAP Project Number: All

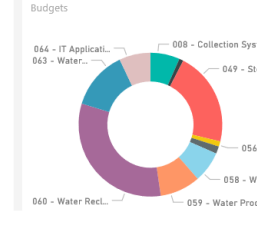
Average Monthly Spending



Spending vs. Budget



Budgets



Project Remaining Budget

Project	Remaining Budget
WRF Rehab, Replacement and Impro...	119,916,505.00
Future Drainage Improvements (Plac...	107,927,225.00
Future Biosolid Projects (Placeholder)	82,900,000.00
Future WIP Projects (Placeholder)	56,634,402.00
SCADA Future Budget Placeholder	45,634,780.00
Water Production Rehab, Replace, Im...	40,800,000.00
Gravity Sewer and Force Main Rehab ...	39,000,000.00
F-1049 Future System-Economic Dev...	36,000,000.00
Future Distribution System Rehab Pro...	35,000,000.00
PS - Pump Station On Call and Emerg...	27,800,000.00
New Water Meter Installations	19,366,364.47
Sanitary Sewer Assessment (Budget P...	18,164,722.32
WRF Equipment Replacement	18,000,000.00
Sewer Rehabilitation Contract (Multi...	16,934,115.00
48-inch PCCP Replacement (Highway...	15,398,721.94
DWR Facility Upgrades (Placeholder)	15,000,000.00
Beaver Ruin Wetland Park	12,560,383.00
2018-2023 Future Uninc Design and ...	12,000,000.00
R-0019 Future Raw Water Intake an...	12,000,000.00
LRWPS - Lanier Raw Water Intake an...	11,542,811.36
GC Water Training Education and Ret...	11,000,000.00
2017 City of Peachtree Corners Drain...	10,690,513.44
2017 Drainage Improvements M-0985	10,645,207.00
48in PCCP Replacement (Sunny Hill R...	10,116,212.88
Membrane Replacement and Rehab	9,784,108.20
Pump Station Decommissioning (Plac...	9,000,000.00
BRB Mixer and NRCY Pump Replace...	8,978,345.24
48 PCCP Replacement (I-985 to Bufor...	8,160,000.00
PCCP Replacement Program (Placeho...	8,000,000.00
F Wayne Hill Operations Building Exp...	7,651,983.82
PS - Pump Station Rehab and Replac...	7,621,402.38

Optimization of Project Portfolio

FILTER

Filters Load Data Samples

Region

DC Water

Project Type

WPM, SPM

Generate Model Data

Select projects for baseline

Optional: Load Baseline Plan File

Browse...

No file selected

Apply Loaded Plan

Download Displayed Plan

Imported baseline plan files work on column index rather than column names but please remember the Name and Must fields.

Name	Must	2020	2021	2022	2023
DE02-Small Diameter Water Main Repl 12B	<input checked="" type="checkbox"/>				
DE03-Small Dia Water Main 12C-C&L	<input checked="" type="checkbox"/>				
KH01-Small Diameter Water Main Rehabilitation 21	<input checked="" type="checkbox"/>				
KF50-DDOT Water Projects 19	<input checked="" type="checkbox"/>				
KE50-DDOT Water Projects 18	<input checked="" type="checkbox"/>				
KE01-Small Dia Water Main Rehab 18	<input checked="" type="checkbox"/>				
O304-Constitution Ave NE	<input checked="" type="checkbox"/>				
O307-SDWWR Hillcrest Area	<input checked="" type="checkbox"/>				
KG01-Small Diameter Water Main Rehabilitation 20	<input checked="" type="checkbox"/>				
C904-66" Low Service Steel Main at 8th Street NE & SE	<input checked="" type="checkbox"/>				
FT08-LDWM Rehab 4D	<input checked="" type="checkbox"/>				
C902-20" Main at Constitution Ave NE W/ O304	<input checked="" type="checkbox"/>				
FT07-Water Mains on Bridges Repairs Contract 1	<input checked="" type="checkbox"/>				
FT02-Brentwood Steel Mains Long Term Repairs	<input checked="" type="checkbox"/>				
FT03-Out of Service LDWM Elimination Contract I	<input checked="" type="checkbox"/>				
MA02-Installation of PRVs	<input checked="" type="checkbox"/>				
FT06-66-inch/72 inch PCCP N Street	<input checked="" type="checkbox"/>				
F602-Steel Water Mains Contract 2	<input checked="" type="checkbox"/>				
GX01-Large Dia. Water Main Repl. II	<input checked="" type="checkbox"/>				
K701-Large Diameter Water Main Replacement 6	<input checked="" type="checkbox"/>				
JZ00-Large Dia Water Main Repl 3 - 4 & 5	<input checked="" type="checkbox"/>				
PK01-Federally Owned Water Mains - Meter Vaults	<input checked="" type="checkbox"/>				
HR01-Electrical Mechanical and Instrumentation Upgrade	<input checked="" type="checkbox"/>				
PS01-Existing Water Facilities Building Optimization	<input checked="" type="checkbox"/>				
LT01-Water System SCADA	<input checked="" type="checkbox"/>				
FT05-IDIQ Pipeline Condition Assessment	<input checked="" type="checkbox"/>				
HI01-Lighting Pump Controls Drainage and Misc. Improve	<input checked="" type="checkbox"/>				

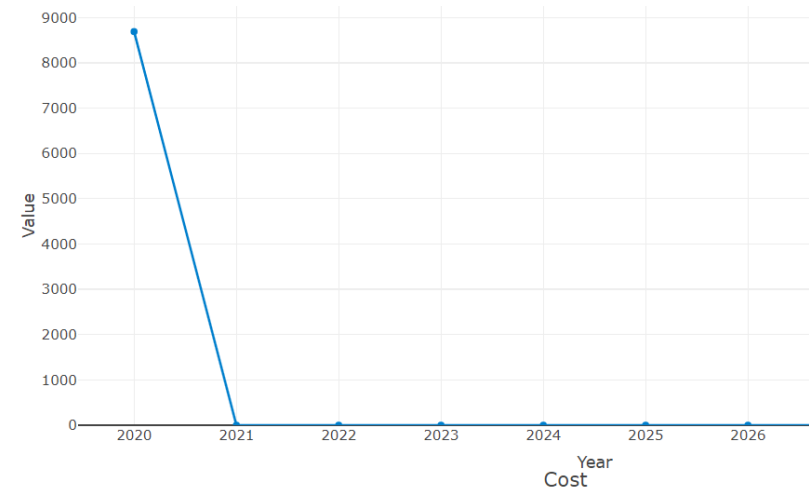
Run Baseline

Save Scenario

Viewer

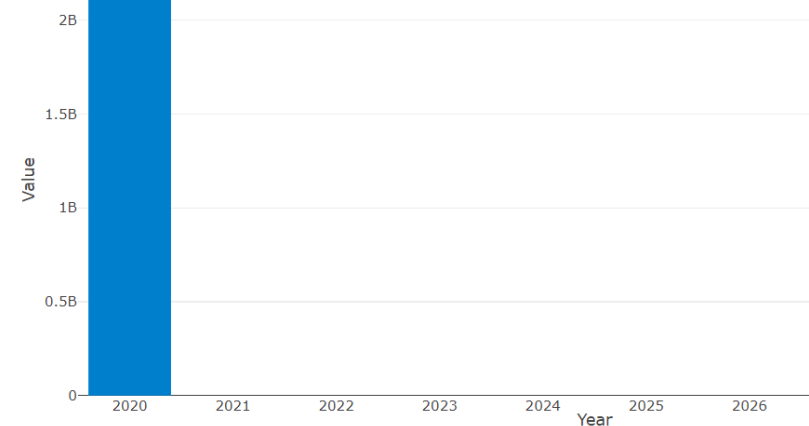
Settings

Benefit



Value

Year



Value

Year

Optimization of Project Portfolio

FILTER
MODIFY
OPTIMIZE
VISUALIZE

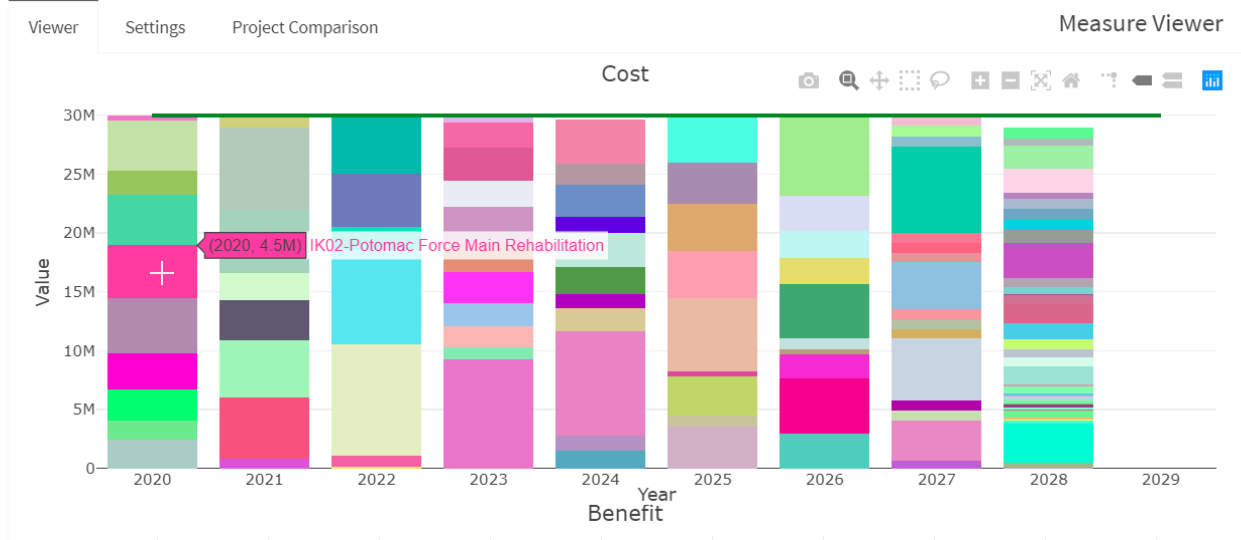
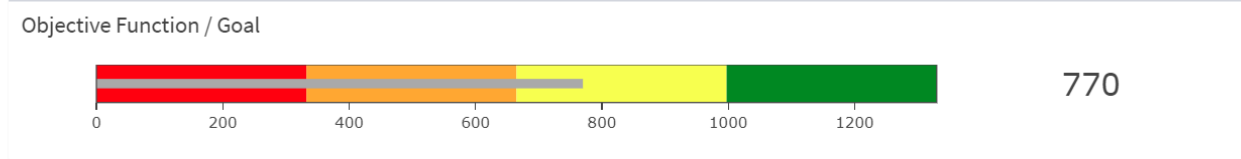
Optimise Constraint Wizard Settings

Optional: Load Constraints File

Select Constraint(s) Cost, WPM Cost, SPM Cost, Benefit, Risk Bene ▾

Name	Bound	Toggle	2020	2021	2022	2023	2024	2025	2026	2027
Cost	Max	<input checked="" type="checkbox"/>	30000000.00	30000000.00	30000000.00	30000000.00	30000000.00	30000000.00	30000000.00	30000000.00
Cost	Min	<input type="checkbox"/>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Risk Benefit	Max	<input type="checkbox"/>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Risk Benefit	Min	<input type="checkbox"/>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Benefit	Max	<input type="checkbox"/>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Benefit	Min	<input type="checkbox"/>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SPM Cost	Max	<input checked="" type="checkbox"/>	25000000.00	25000000.00	25000000.00	25000000.00	25000000.00	25000000.00	25000000.00	25000000.00
SPM Cost	Min	<input type="checkbox"/>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WPM Cost	Max	<input checked="" type="checkbox"/>	10000000.00	10000000.00	10000000.00	10000000.00	10000000.00	10000000.00	10000000.00	10000000.00
WPM Cost	Min	<input type="checkbox"/>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Select Goal Risk Benefit ▾ The goal should be: Maximized ▾



IH04-Emergency Stormwater Storage At McMillan Sandfilters (Bloomingdale)	\$30M - Max Risk Benefit \$25M SPM \$10M WPM	1	2020	0	0	Not Selected	Not Selected
IK01-Potomac Force Main Assessment	\$30M - Max Risk Benefit	1	2020	1	2027	7	Deferred
IK01-Potomac Force Main Assessment	\$30M - Max Risk Benefit \$25M SPM \$10M WPM	1	2020	1	2027	7	Deferred
IK02-Potomac Force Main Rehabilitation	\$30M - Max Risk Benefit	1	2020	1	2020	0	No Change
IK02-Potomac Force Main Rehabilitation	\$30M - Max Risk Benefit \$25M SPM \$10M WPM	1	2020	1	2020	0	No Change
IL01-Creekbed Sewer Rehabilitation Pinehurst Branch (West)	\$30M - Max Risk Benefit	1	2020	1	2026	6	Deferred
IL01-Creekbed Sewer Rehabilitation Pinehurst Branch (West)	\$30M - Max Risk Benefit \$25M SPM \$10M WPM	1	2020	1	2026	6	Deferred
IL02-Creekbed Sewer Rehabilitation Dumbarton Oaks between S St & 32nd St	\$30M - Max Risk Benefit	1	2020	1	2027	7	Deferred

Improving the Journey

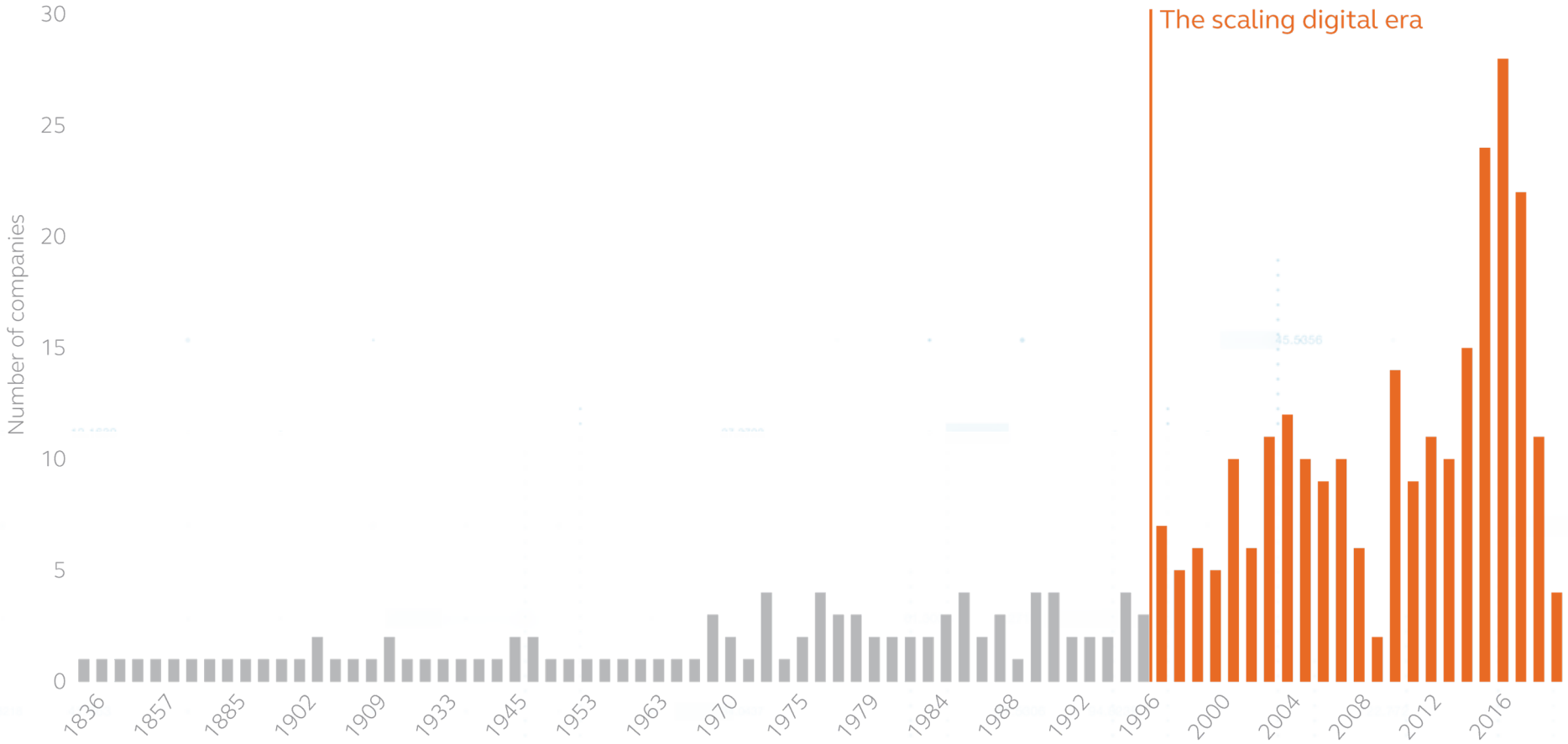
Do's

- **DO** recognize the value of your organization's human assets and capital, and involve them in asset management and investment decisions
- **DO** prioritize and optimize full lifecycle TOTEX costs (i.e., CAPEX + OPEX) when making asset management and investment decisions
- **DO** incorporate real-time asset condition and performance data into maintenance programs, and leverage predictive analytics tools (e.g. AI, ML) to inform decisions
- **DO** supplement your organization's workforce with trained data scientists and analysts to help you unlock the potential of advanced, digitally enabled asset management

Don'ts

- **DON'T** base your organization's asset management and investment on physical linear and vertical assets alone
- **DON'T** make asset management and investment decision on the basis of upfront CAPEX costs alone
- **DON'T** wait for failures, or rely on industry standard assumptions or asset age alone, to determine which assets to prioritize for maintenance or replacement
- **DON'T** rely on traditional utility skillsets alone to confront the challenges of 21st century water and wastewater infrastructure operations and asset management

Digital water companies are flooding the market



Digital Water Companies by Year of Founding. Source: Bluefield Research

Thank you for attending!

Learn more about building a fit-for-future utility



KEVIN SLAVEN

Asset Management Practice Leader

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- c** 330 990 2726
- e** Kevin.Slaven@arcadis.com



Learn more by visiting:
www.arcadis.com