

INTEGRATING ASSET MANAGEMENT AND EMERGENCY PREPAREDNESS TO ASSESS RISK

Corinne Ketchum PE | June 13, 2018



Today's Agenda



>Asset Management Drivers and Best Practices
>Asset Management Process
>J100 Vulnerability Assessment Processes
>Integrating the Processes
>States Requiring Integrated Approaches
>Questions & Discussion



Asset Management Definition – adapted from USEPA...

Asset Management is a body of management practices that...



Targets the acceptable level of risk to the organization

Management

Practices

Delivers **service levels** customers desire and regulators require Applies to the entire portfolio of infrastructure assets at all levels

of the organization



Seeks to minimize total costs of acquiring, operating, maintaining, and renewing assets



Works within an environment of **limited resources**





Typical Drivers in the US are Evolving...



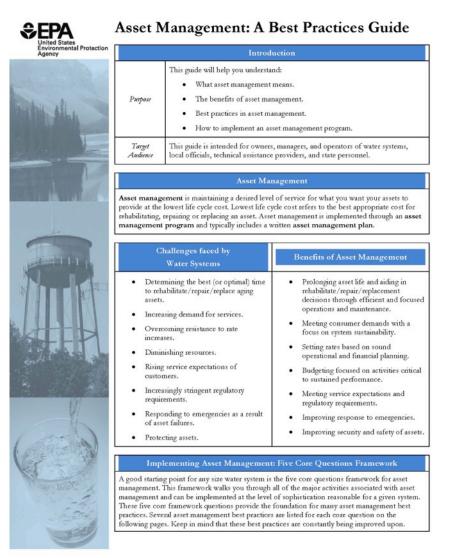
- "Wish list"
- Unaffordable **Budgets**
- Aging Infrastructure

- **Requirements**
- NPDES permits and consent decrees
- SRF loans

- Rating agencies starting to look for it
- Issues
- Incomplete data sets
- Poor hierarchies
- Lack of value

ARCADIS Consultance Asset Management Trend for US

- US EPA mandating Asset Management
 - Capacity, Management, Operations, and Maintenance (CMOM) Program
 - Administrative Orders
- Several States are promoting asset management
 - Permit Requirement
 - SRF Funding Requirement
 - Principal Forgiveness
 - Grants

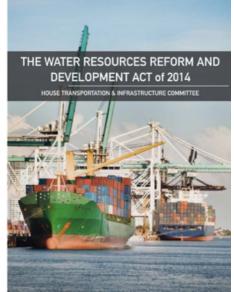




AWWA Survey of Asset Management Requirements for State Revolving Funds and Other Programs

Water Resources Reform and Develop Act (WRRDA) of 2014

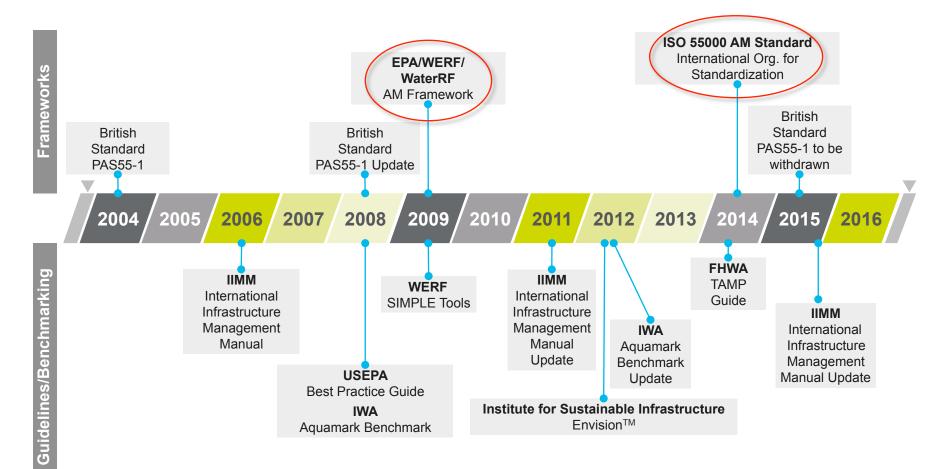
Requires Fiscal Sustainability Plans (FSPs) for Clean Water SRF Loan Recipients



	F	SP Requirements:	Asset Management
AND	•	Inventory of critical assets	
E	•	Evaluation of condition and	performance of assets
	•	Plan for maintaining, repair	ring, or replacing assets
	•	Plan for funding these activ	vities
	•	Certification of consideration energy and water conservation	



Asset Management Evolution: Two Widely Recognized Frameworks





Introduction to Best Practices

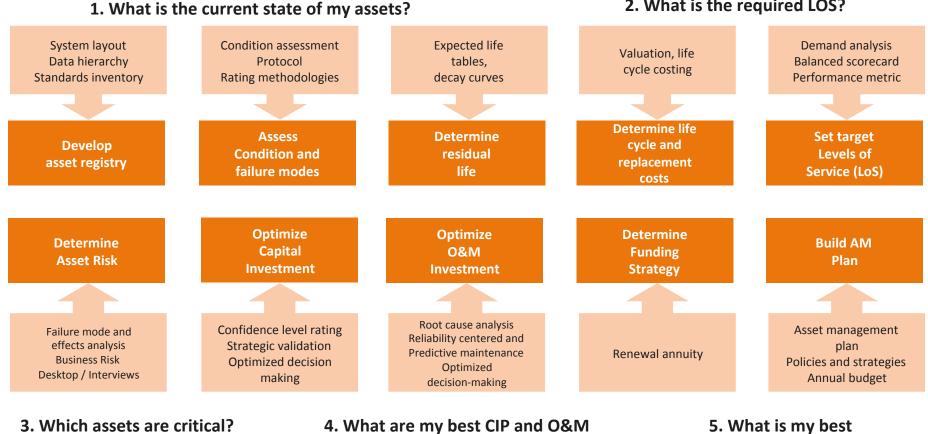


ISO 55000 – "what" a program requires

- A management system standard, like others you may be familiar with such as ISO 9001, ISO 14001, etc.
 - ISO 55000 Overview, Principles and Terminology
 - ►ISO 55001 Requirements
 - ➤ISO 55002 Guidelines



EPA / WERF/ WaterRF Framework



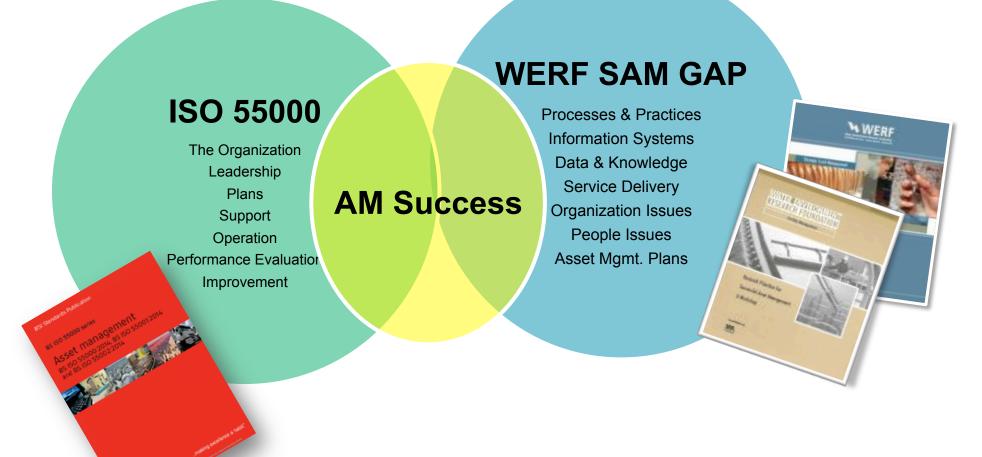
strategies?

2. What is the required LOS?

funding strategy?



Best in Class Programs Use a Blended Approach



bsi



Leading Practice Concepts of Asset Management for Capital Planning



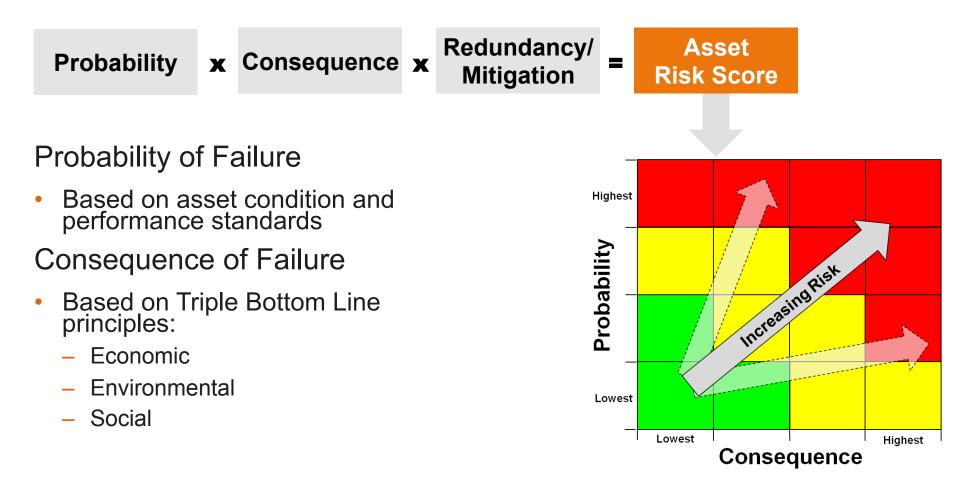


Service Levels Build Transparency and Stakeholder Relationships

		•	SCH BURNEL
SL Category	Water	Wastewater	Benchmarking
Reliability	 water main breaks unaccounted for water worst served customers 	 sewer blockages / collapses SSOs / CSOs spills / backups 	Performance Indicators for Water and Wastewater Utilities: 2006 Annual Survey Bata and Asulysis Report
Quality	 customer complaints (pressure, taste/ odor, color) 	 odor complaints from pump stations and WWTPs 	Water Distribution
Customer Service	 outage response call center performance 	 event response call center performance 	10 5 0 2003 2004 2005 2005 2006 2007
Regulatory	•water quality compliance	 discharge permit compliance 	 Current Performance Trends and Issues Stable performance driven by rehabilitation and renewal program of 100 miles per year. Continued focus on oldest cast iron pipe and worst served areas. 2007 performance impacted by spike of 75 third party
			damage incidents during downtown light rail construction .

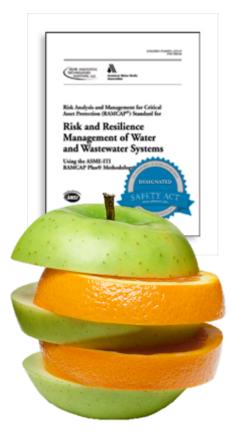


Leading Practice Asset Management Should Be Risk-Based





What is the AWWA J100 Standard?



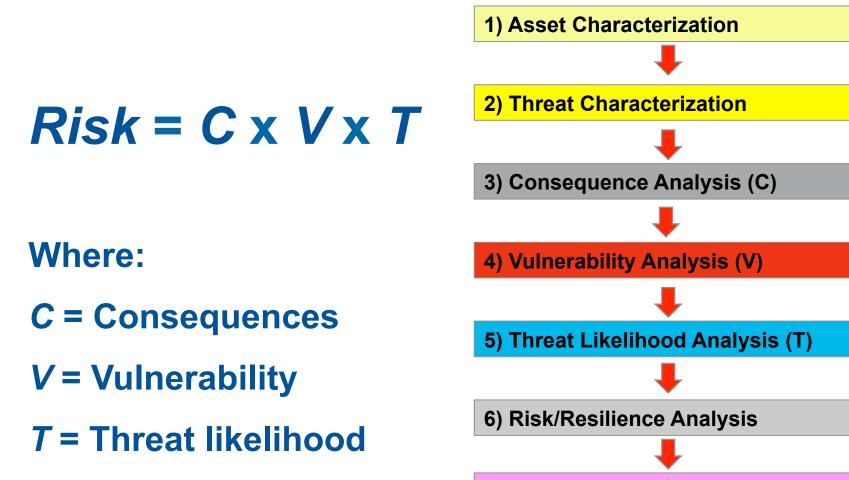
Analyzes a broad range of threat/hazard types

Methodology to quantify risk

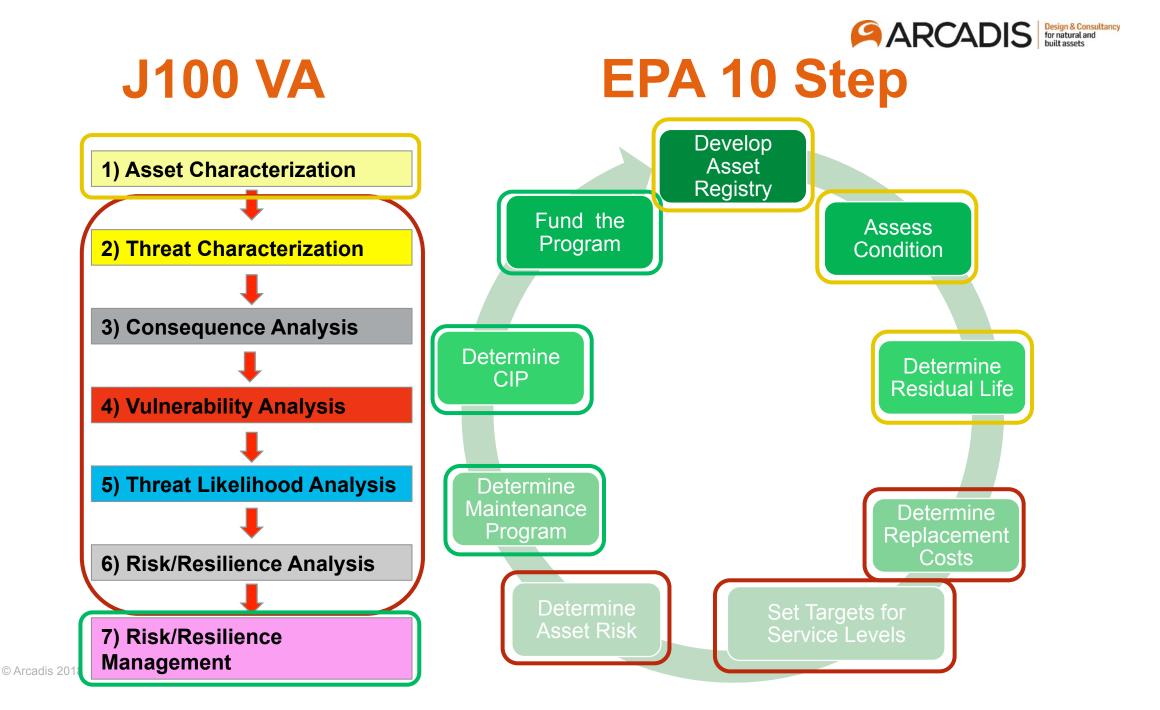
Relentless prioritization

Foundational component to a risk management program

J100 Process and Risk Assessment



7) Risk/Resilience Management





Risk Calculation / Definition

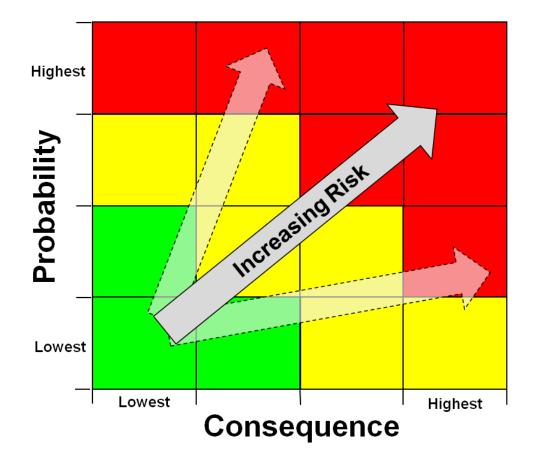
 $R = C \times V \times T$

Where:

- **C** = Consequences
- *V* = Vulnerability
- *T* = Threat probability

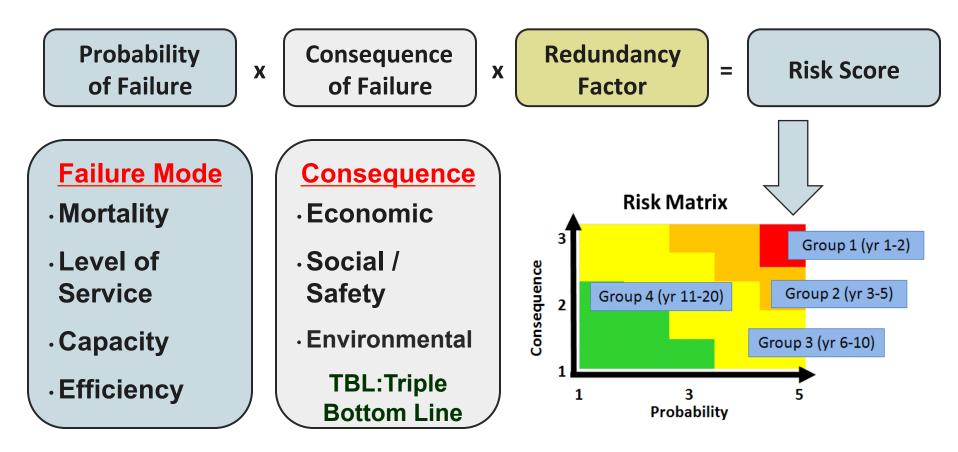


R = Probability x Consequence





Assign Risk: Risk Supports Optimization of Capital Improvement Programs



"Right projects at the right time"



Risk Mitigation Measures (RMMs)



- Can a single project benefit multiple assets?
- Continuous process
- Emergency Preparedness / Contingency Planning

Emergency Preparedness Program?

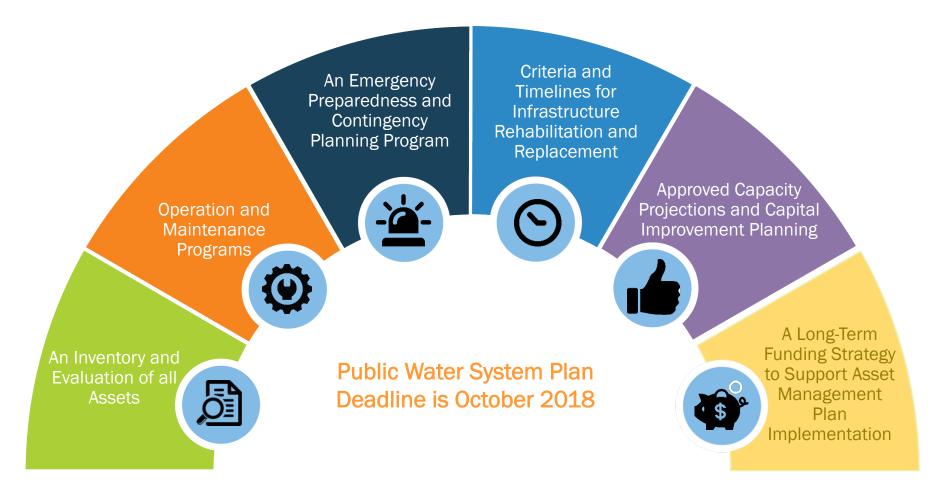




- **P**lan: All-Hazards EOP & COG
- Organize/Equip: Budget, Grants
- Train: ICS & EOC
- **E**xercise: City, County, Regional, State
- **E**valuate: After-Action Reports



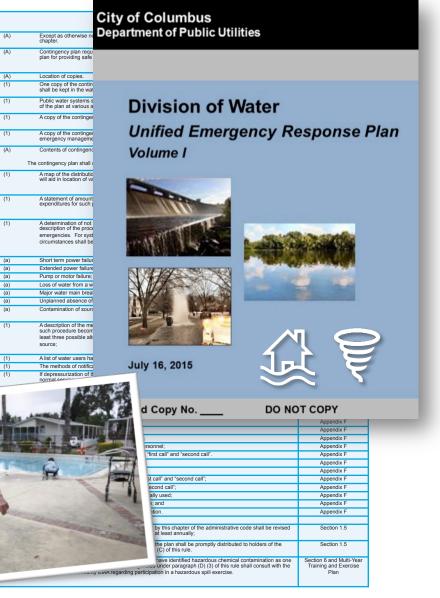
Ohio EPA Asset Management Plan Requirements (Senate Bill 2)



Ohio Contingency Plan Requirements

- OAC 3745-85-01
- Public Drinking Water Systems
- Identify response actions to:
 - Protect people
 - Preserve property
 - Protect the environment
 - Maintain operations & minimize disruption to the public





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NJDEP Asset Management Plan Requirements



NPDES Permit July 2016 and Drinking Water Systems Spring 2019

- ASSET INVENTORY AND CONDITION ASSESSMENT
 - Inventory shall include type of asset, age, condition, service history, size, capacity, • performance, current condition, current value, and estimated remaining useful life.
- 2. LEVEL OF SERVICE
 - Service Levels •
 - Key Performance Indicators •
- **IDENTIFY CRITICAL ASSETS** 3.
 - Assess Criticality •
 - Vulnerability Assessment •
- LIFE-CYCLE COSTING 4.
 - Determine Infrastructure Repair versus Replace •
- FINANCIAL PLANNING 5.
 - Long-Term Funding •

The standards and best practices contained in this document are required elements for new projects seeking State funding under the New Jersey Environmental Infrastructure Finance Program (NJEIFP). Further information on the NJEIFP can be found at the following link(s): https://www.njeit.org/ and http://www.nj.gov/dep/dwq/mface.htm

> Asset Management **Guidance and Best Practices**

Managing Utility Assets in New Jersey

Introduction

The NJDEP is responsible for evaluating, managing and protecting New Jersey's water resources to ensure that a safe, adequate, and reliable water supply is available to the public and to restore, enhance, and maintain the chemical, physical, and biological integrity of the waters of the State. To ensure drinking water and wastewater systems are adequately maintained and operated to continually and reliably meet customer service expectations as well as comply with applicable permit conditions, NJDEP rules generally require drinking water and wastewater utilities to demonstrate that they have adequate facilities, and equipment, and that they regularly perform operation and maintenance to meet the conditions in their permits.1 This includes conducting an inventory of system assets, providing adequate staffing and training, performing preventative maintenance, and demonstrating adequate funding. In order to meet these requirements, a utility must identify its needs and costs, and develop long-range financial plan

GUIDE]

is through the developme Asset management plann efficiency and the reliabi inventories, operation an revenue reserves and rein facilitate long-term viabi major, generally recogniz asset management plan in · Performing an inve assessment of the s · Defining level of s · Identifying critical · Establishing life cy · Developing a long-

Purpose

Many systems currently operate their facilities so their permits, the Departs an asset management stra responsible investment a infrastructure.

New Jersey Department of Environmental Protection

(609) 292-9977

This document is intended to provide water system personnel with a tool to evaluate and improve the accuracy and completeness of the Management Plan (AMP). This document is intended to be a resource on components that should be considered for inclusion in the AMP; as well as to help dentify areas of the AMP that need to be updated. Each system is unique and personnel should use their expertise and knowledge of their system to determine what is needed in the Plan. This document is a resource only and does not supersede or replace statutory, regulatory, or permit requirements. Usin this Asset Management Plan Assessment Guide should help personnel identify if each topic is included in the AMP and if the information related to that topic arrent. The information contained in the Departments "Asset Management Guidance and Best Practices" http://www.ni.gov/dep/watersupply/pdf/guid amp.pdf and EPA's "Asset Management: A Best Practices Guide" was used as a starting point for this guide, but is supplemented with additional in fools as well as additional resources are listed on the last page of this document.

ASSET MANAGEMENT PLAN ASSESSMENT

Division of Water Quality

ARCADIS Design & Consultancy for natural and built assets

New Jersey – Asset Management Guidance

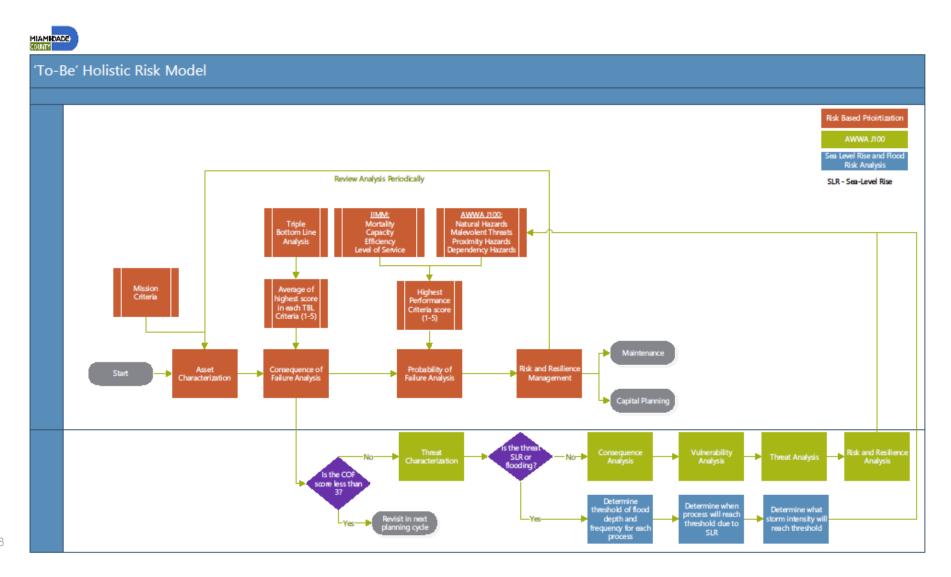
Evaluate:

- Power supply (primary and auxiliary)
- Communication
- Equipment and Supplies
- Personnel Capabilities
- Security
- Emergency Procedures
- Treatment Processes Capabilities
- Conveyance/Distribution Capabilities

Asset Management Technic
Asset Management Technical Guidance
To promote the responsible maintenance, investment, and rehabilitation of New Jersey's clean water and drinking water systems, the New Jersey Department of Environmet (DEP) is providing this technical guidance' had outlines the essential elements of asset management. Adherence to the general principles of asset management fasters compliance with on the five (5) Core Elements of asset management as identified by the U.S. Environmental Protection Agent, informs government officials, with managers, and satif about the Asset Management Program. Together, downeration of the components of asset Management can be considered an Asset Management Plan (AMP).
Level of Service
Long-Term Funding Strategy
Appendix A: Acces M
9 9
 Asset Inventory/Mapping and Condition Assessment Asset Inventory/Mapping and Condition Assessment Asset Inventory/Mapping and Condition Assessment Components (i.e., pipes, valves, tanks, pumps, wells, treatment facilities, hydratis, and any off system components in their conditioned and catalogued, the next cutical steps of any off system components (i.e., pipes, valves, tanks, pumps, wells, treatment facilities, hydratis, and any off system components (i.e., pipes, valves, tanks, pumps, wells, treatment facilities, hydratis, and any off system components (i.e., pipes, valves, tanks, pumps, wells, treatment facilities, hydratis, and any off system components (i.e., pipes, valves, tanks, pumps, wells, treatment facilities, hydratis, and any off system components (i.e., pipes, valves, tanks, pumps, wells, treatment facilities, hydratis, and any off system components (i.e., pipes, valves, tanks, pumps, wells, treatment facilities, hydratis, and any off system components (i.e., pipes, valves, tanks, pumps, wells, treatment facilities, hydratis, and any off system components (i.e., pipes, valves, tanks, pumps, wells, treatment facilities, hydratis, and any off system components (i.e., pipes, valves, tanks, pumps, wells, treatment facilities, hydratis, and any off system components (i.e., pipes, valves, tanks, pumps, pump
September 2016
Localofficials.pdf
Page 1



Miami-Dade WASD – AM-Resilience Integration





Asset Management

Example – Columbus DPU

Asset Characterization

2) Threat Characterization

3) Consequence Analysis

4) Vulnerability Analysis

5) Threat Likelihood Analysis

6) Risk/Resilience Analysis

7) Risk/Resilience Management

Criticality Connect Assets to Risk



Tier	Essential Function					
1	Conveyance					
2	Solids Removal/ Handling					
3A	Treatment- Minimal	Tar Exclusive/sources Distribution Tar Dubles 2000000000000000000000000000000000000				
3B	Treatment – Permit	Openation 100 10				
4	Other Plant Services	Langung T, Trajan G, Ville Ratins - das 10 10 10 Langung T, Trajan G, Ville Ratins - das 10 10 10 Langung T, Trajan G, Ville Ratins - das 10 10 10 Langung T, Trajan G, Ville Ratins - das 10 10 10 Langung T, Trajan G, Ville Ratins - das 10 10 10 Langung T, Trajan G, Ville Ratins - das 10 10 10 Langung T, Trajan G, Ville Ratins - das 10 10 10 Langung T, Trajan G, Ville Ratins - das 10 10 10 Langung T, Trajan G, Ville Ratins - das 10 10 10 Langung T, Trajan G, Ville Ratins - das 10 10 10 Langung T, Trajan G, Ville Ratins - das 10 10 10 Langung T, Trajan G, Ville Ratins - das 10 10 10 Langung T, Trajan G, Ville Ratins - das 10 10 10				
		Audary Staten				





Example – Columbus DPU

1) Asset Characterization

- **2)** Threat Characterization
 - 3) Consequence Analysis
 - 4) Vulnerability Analysis
 - 5) Threat Likelihood Analysis
 - 6) Risk/Resilience Analysis

7) Risk/Resilience Management

- Malicious
- Dependency
- Proximity

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TORNADO

ERP









Example – Columbus DPU

1) Asset Characterization Asset Management 2) Threat Characterization 3) Consequence Analysis 4) Vulnerability Analysis **Threat Likelihood Analysis** 6) Risk/Resilience Analysis 7) Risk/Resilience Management



Consequences: Triple Bottom Line & VA Analyses



- Revenue Loss
- Repair/Replacement Cost
- Work-around Cost
 - Injuries
 - Deaths
 - Regional economic loss
- Non-compliance
- Cleanup



J100 – 7 Step Process

1) Asset Characterization

2) Threat Characterization

3) Consequence Analysis

4) Vulnerability Analysis

5) Threat Likelihood Analysis

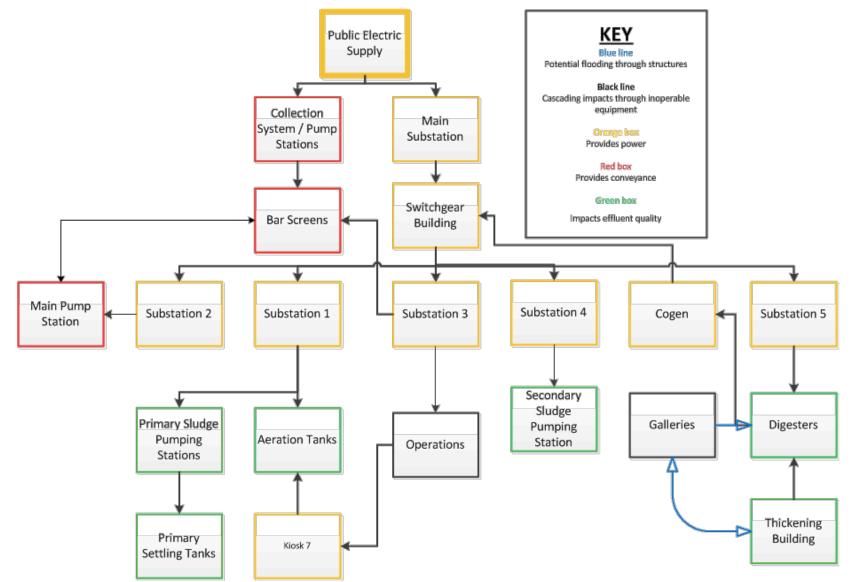
6) Risk/Resilience Analysis

7) Risk/Resilience Management



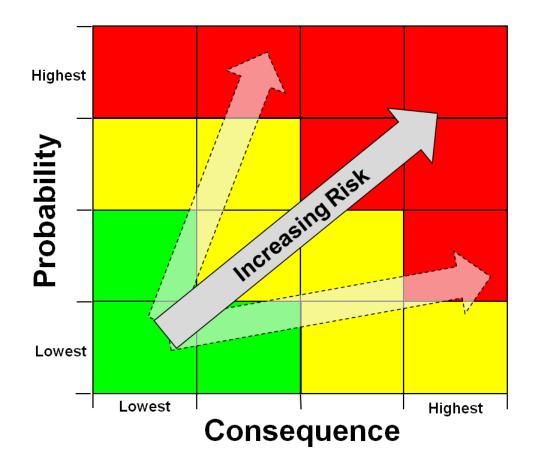


Risk from Criticality Supports Mitigation Measures





Risk Mitigation Measures (RMMs)



- Can a single project benefit multiple assets?
- Continuous process
- Iterative Process



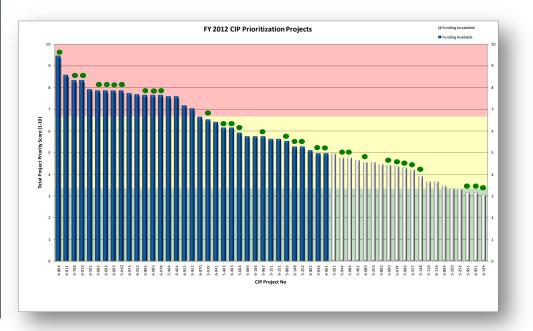
Steps to Bundle, Validate and Prioritize CIP

Assess and Analyze Asset Data and Establish Policies and Procedures	Conduct Risk Assessment	Develop 5/20 Year Capital Investment Plan (CIP)			Analyze and Review Financial and Rate Implications		
🔋 Project Priority	view by Project Type 2007-2013 (Non-Escalated Costs)			Estimated Annua	l Expenditure		
High Probability/ Consequence or impact / Alignment High Probability/ Consequence or impact / Alignment High Probability/ Consequence or impact / Alignment High Probability/ Consequence or impact / Alignment High Probability/ Consequence of Failure (Rehab / Renewal / Replacement Projects) Project Impact (Enhancement / Growth Projects)	Project Name	Priority Project Type	2007	2008	2009	2010	Total
mpact /Alignment	vns Wet Well and ORF Improvements	High Growth / Augmentation	\$ -	\$ 1,000,000	\$ 4,600,000 \$	1,300,000	\$ 7,900,000
۲ / Ke bit	/Aurora S Pump Station Improvements	Med High Growth / Renewal	\$ -	\$ - :	\$-\$	-	\$ 4,000,000
t (Enh	PS Replacement	Low Growth	\$ -	\$ 200,000	\$ 300,000 \$	-	\$ 500,000
Righ Priority			\$-	\$ 1,700,000	\$ 5,300,000 \$	1,300,000	\$ 13,300,000
de de la compresentación de la compresentac	tions eet PS Improvements	High Augmentation	\$ 1,000,000	\$ 4,000,000	s - s	-	\$ 5,000,000
Low Priority Med Priority	id PS Improvements	High Augmentation	\$ 100,000	\$ - :	\$-\$	-	\$ 1,900,000
	stern PS Elimination	Med High Augmentation	\$ -	\$ - :	\$-\$	-	\$ 700,000
Consequence of Failure (Rehab / Renewal / Replacement Projects)	vns Solids Handling	Med Augmentation	\$ -	\$ 2,000,000	\$ 4,000,000 \$	880,000	\$ 6,880,000
	ation Elimination Evaluation (Greenmeadow)	Low Augmentation	\$ -	\$ 580,000	\$-\$	-	\$ 580,000
Augmentation - Collection Syst 34 3 Rush C	em Creek Interceptor	Med High Augmentation	\$ -	\$ - :	\$ 4,000,000 \$	2,800,000	\$ 10,300,000
Augmentation - Other 61 All CMMS	Implementation	Med Augmentation	\$ 290,000	\$ 1,145,000	\$ 3,145,000 \$	-	\$ 4,580,000
TOTAL - AUGMENTATION Renewal / Rehabilitation / Reol	acement - Plant and Lift Stations		\$ 1,630,000	\$ 9,295,000	\$ 13,145,000 \$	6,580,000	\$ 36,650,000
	a & Industrial Parkway HVAC	High Renewal	\$ -	\$ 350,000	\$-\$	-	\$ 350,000
40 6 Lackav	wanna STP Chlorine Building and Primary Tank Repairs	Med High Renewal	\$ -	\$ 170,000	\$-\$	-	\$ 170,000
63 3 Southt	owns Roof Replacement	Med Renewal	\$ -	\$ - !	\$-\$	1,400,000	\$ 1,400,000
Renewal / Rehabilitation / Repl 32 3 Village	acement - Collection System : of Hamburg Collection System	High Renewal	\$ 592,000	\$ 1,000,000	\$-\$	-	\$ 1,592,000
	ement of ACP along Transit Road* hem Park PS and Collection System Improvements	High Renewal High Renewal	\$ 500,000 \$ 250,000				\$ 1,800,000 \$ 750,000
	d Avenue Sewer Replacement* urora Collection System Replacement NYS DOT	High Renewal Low Renewal	\$ 600,000 \$ 2,000,000		\$-\$		\$ 800,000 \$ 2,000,000
TOTAL - RENEWAL / REHAL	BILITATION / REPLACEMENT		\$ 6,082,000	\$ 6,620,000	\$ 1,200,000 \$	1,400,000	\$ 15,302,000
Total - All Projects			\$ 7,712,000	\$ 17,615,000	\$ 19,645,000 \$	9,280,000	\$ 65,252,000



Projects Can Be Validated and Prioritized Through Defined Criteria

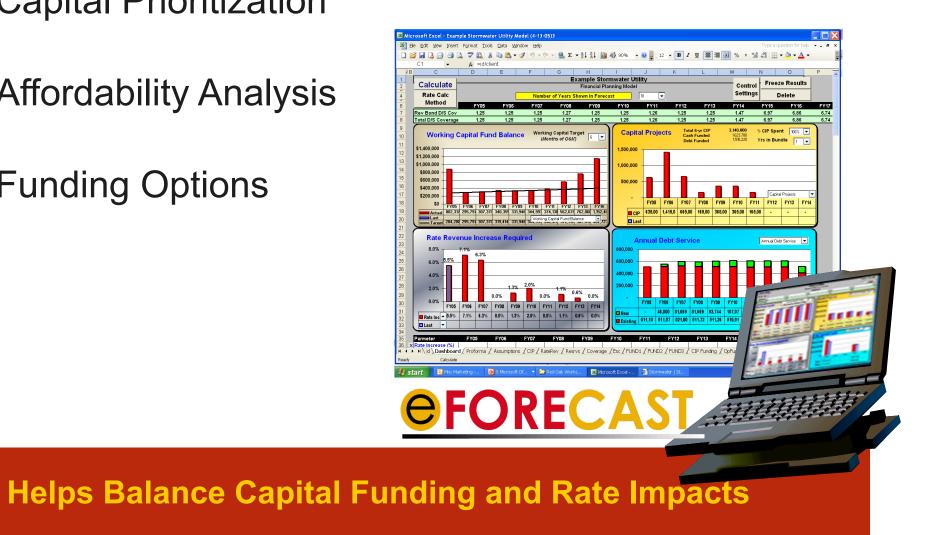
- Strategic Plan Alignment
- Physical Condition
- Performance Condition
- Risk
- Potential Risk Reduction
- Benefit Cost Analysis
- Service Level
- Public Benefit
- Financial





Sustainable Financial Projections

- Capital Prioritization
- Affordability Analysis
- Funding Options





ROI – Asset Management Program Implementation Outcomes

- Quantitative
- Qualitative







ROI – Vulnerability Assessment Outcomes





0826425

Numerous Funding Sources

- USDA • HUD
- USACE
- FEMA

13, 2014 at 4:30 am

Cuomo: FEMA Approves \$730M to Repair Bay Park

RO

V 60

• EPA

Package is largest FEMA)

By Joseph Kellard (Open Post)

Plant

State Funds

ALL DESTS, FUELAL

B

BENEFIT

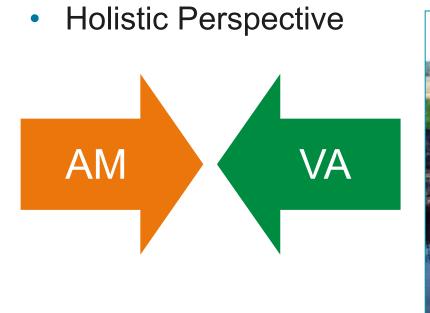
• FTA





A More Holistic Resilience Management Approach

- Understand Internal Risks (Asset Management)
- Understand External Risks (Vulnerability Assessment)







What's Next?

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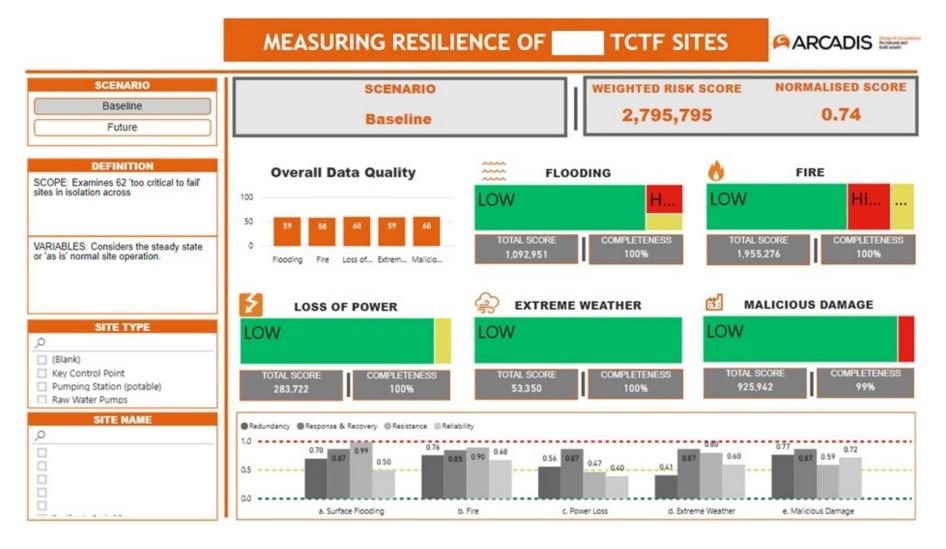
- Moving toward Enterprise Risk Management merging AM & VA
- Improved evaluation of regional economic impacts
- Innovation
- Technology:
 - Analytics & machine learning
 - Continued focus on cybersecurity
 - NIST Cybersecurity Framework
- J100 v2 is pending
- Black skies preparedness planning
- Improved communications and customer engagement

Leveraging Analytics for Asset Management and Vulnerability Assessment





Resilience Dashboard





Thank you!



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