

Utility Risk and Resilience Assessments: America's Water Infrastructure Act (AWIA) Lessons Learned from the Trenches

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BLACK & VEATCH

Welcome and Introductions

The background of the slide is a solid black color. Overlaid on this is a dynamic pattern of small, bright blue dots. These dots are arranged to form a series of overlapping, wave-like or ripple-like shapes that originate from the bottom left and spread outwards towards the top right. The density of the dots varies, creating a sense of depth and movement. The overall aesthetic is modern and digital.

Introductions



Jian Zhang, Water Research Foundation – Research Program Manager



Will Williams, Black & Veatch – Associate Vice President, Planning & Asset Management



Ahmet Ozman, Black & Veatch – Senior Consultant, Planning & Asset Management



Kevin Harper, Black & Veatch – Senior Technical Advisor, Planning & Asset Management

Project Participants

Participating Utilities

Kansas City Board of Public Utilities, KS	Hampton Roads Sanitation District, VA	City of Tulsa, OK	South East Water Corporation (Australia)
Loudoun Water, VA	California Department of Water Resources, CA	Colorado Springs Utilities, CO	Great Lakes Water Authority, MI
Lansing Board of Water and Light, MI	Coachella Valley Water District, CA	American Water, multiple states	City of Phoenix, AZ
City of Topeka, KS	Charlotte Water, NC	County of San Diego, CA	Miami Dade County, FL
City of Griffin, GA	Town of Cary, NC	Forsyth County, GA	Irvine Ranch Water District, CA

- **Project Advisory Committee (PAC) Members**
 - Mike Britch, Tulatin Valley Water District
 - Bart Weiss, Hillsborough County Water
 - Gabe Mussio, City of Houston, Dept. of Public Works
 - Alan Cohn, NYC DEP
 - Erica Brown, AMWA
- **Technical Advisory Committee (TAC) Members**
 - Sunil Sinha, Virginia Tech University
 - Kevin Morley, AWWA



Today's Discussion

- WRF Project 5014 Overview and Webinar Objectives
- AWIA Overview
- AWIA Execution Lessons Learned
 - Overview
 - General – AWIA Scope and Recertification, Recommended Utility Resources, and Document Management
 - Risk and Resilience Assessments
 - Emergency Response Plans
 - Risk Assessment Tools
- Key Takeaways

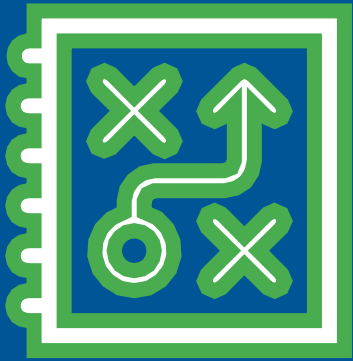




WRF Project 5014 Overview and Webinar Objectives

WRF 5014 Project Overview

- **Focus: Development of a practical framework for assessing resilience**
 - Water, Wastewater, Stormwater utilities
- **Need: Complexity of resilience and risk management**
 - Challenges interpreting & responding to AWIA requirements
 - Plethora of regulations, guidelines, standards and tools
 - Utilities need help navigating these
 - Opportunity to learn from other infrastructure industries
- **Continuing to build upon previous WRF resilience-related projects**



Webinar Objectives

- Provide a high-level overview of AWIA requirements
- Discuss execution lessons learned in the trenches
- Help participants identify path forward

Two Important Notes:

- **WRF 5014 = AWIA Compliance + Resilience Best Practices**
- **Today's Webinar Focus = AWIA Compliance Only**



AWIA Overview

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RISK AND RESILIENCE ASSESSMENTS AND EMERGENCY RESPONSE PLANS:

NEW REQUIREMENTS FOR DRINKING WATER UTILITIES

RISK AND RESILIENCE ASSESSMENT

Your utility must conduct a risk and resilience assessment and submit certification of its completion to the U.S. EPA by the following dates:

Important Dates

- March 31, 2020 if serving ≥100,000 people.
- December 31, 2020 if serving 50,000 to 99,999 people.
- June 30, 2021 if serving 3,301 to 49,999 people.

Section 2013 of America's Water Infrastructure Act of 2018 (AWIA) requires community water systems¹ that serve more than 3,300 people to complete a risk and resilience assessment and develop an emergency response plan.

EMERGENCY RESPONSE PLAN

Your utility must develop or update an emergency response plan and certify completion to the U.S. EPA **no later than six months** after risk and resilience assessment certification. Each utility deadline is unique; however, the dates below are the due dates for utilities who submit a risk and resilience assessment certification by the final due date according to the population served.

- September 30, 2020 if serving ≥100,000 people.
- June 30, 2021 if serving 50,000 to 99,999 people.
- December 30, 2021 if serving 3,301 to 49,999 people.

Recertification

Every five years, your utility must review the risk and resilience assessment and submit a recertification to the U.S. EPA that the assessment has been reviewed and, if necessary, revised.

Within six months of submitting the recertification for the risk and resilience assessment, your utility must certify it has reviewed and, if necessary, revised, its emergency response plan.

Visit the U.S. EPA website to find more information on guidance for developing a risk and resilience assessment at <https://www.epa.gov/waterriskassessment/conduct-drinking-water-or-wastewater-utility-risk-assessment>.

Visit the U.S. EPA website for guidance on developing an Emergency Response Plan at <https://www.epa.gov/waterutilityresponse/develop-or-update-drinking-water-or-wastewater-utility-emergency-response-plan>.

TOOLS OR METHODS

AWIA does not require the use of any standards, methods or tools for the risk and resilience assessment or emergency response plan. Your utility is responsible for ensuring that the risk and resilience assessment and emergency response plan address all the criteria in AWIA Section 2013(a) and (b), respectively. The U.S. EPA recommends the use of standards, including AWWA 100-10 Risk and Resilience Management of Water and Wastewater Systems, along with tools from the U.S. EPA and other organizations, to facilitate sound risk and resilience assessments and emergency response plans.

¹ Section 2013 of AWIA applies to community water systems. Community water systems are drinking water utilities that consistently serve at least 25 people or 15 service connections year-round.

Still have questions about the new AWIA requirements?
Contact the U.S. Environmental Protection Agency (U.S. EPA) at dwrresiliencehelp@epa.gov.

Office of Water (M30RT)
EPA-817-F-18-004
April 2019

What Is AWIA?

- America's Water Infrastructure Act of 2018 (AWIA) was passed into law in October 2018
- AWIA Section 2013 replaced the earlier provisions in SDWA regarding bioterrorism threat and created a new requirement for water systems serving more than 3,300 persons to:
 - Conduct a Risk and Resilience Assessment (RRA)
 - Prepare/revise an Emergency Response Plan (ERP) incorporating RRA findings
 - Certify completion of RRA and ERP to EPA

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When will RRAs and ERPs need to be completed?

The utilities must certify to EPA that that have completed RRAs and ERPs by specific dates below:

A

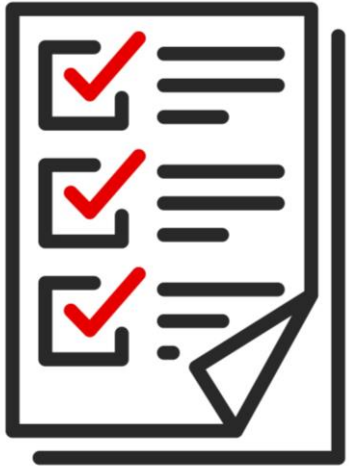
Served Population	Risk and Resilience Assessment	Emergency Response Plans
100,000 or more	3/31/2020 (2025)	9/30/2020 (2025)
Between 50,000 – 99,999	12/31/2020	6/30/2021
Between 3,301 – 49,999	6/30/2021	12/31/2021

Review/revise RRA and ERP as needed; re-certify every 5 years



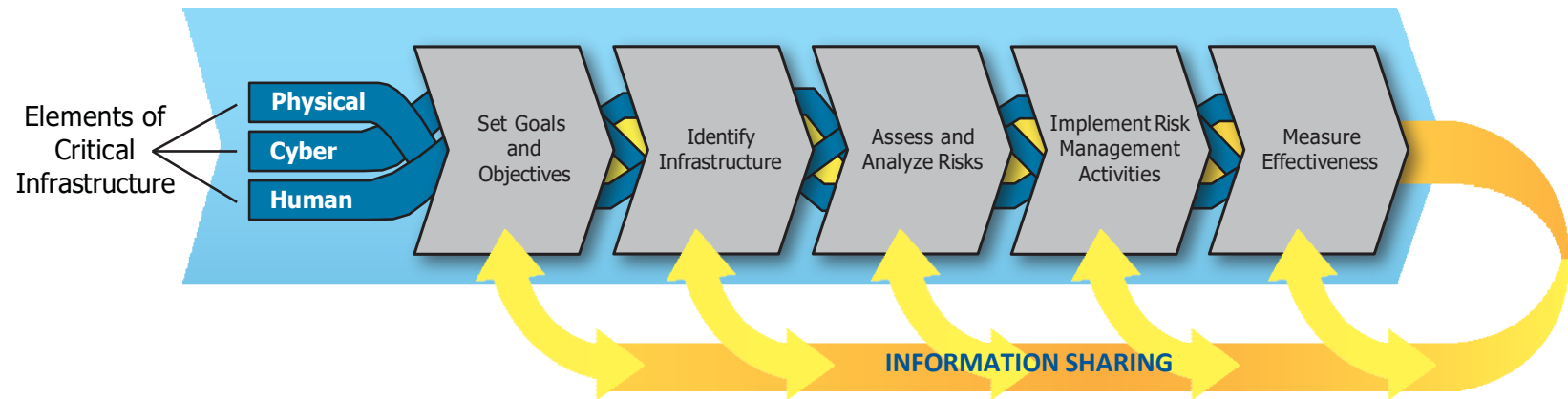
Other Requirements

- Certification to EPA required for compliance – no supporting documents to be submitted to EPA
- Meet the requirements of AWIA Section 2013
- No standard, method or tool specified by EPA
- Certification through online portal, email, or regular mail
- Keep copy of both documents for five years after certification
- Coordination – to the extent possible, coordinate with existing local emergency planning committees when preparing or revising RRA and ERP



Where Is the Water Industry Headed?

- All-hazards risk assessment (acute and chronic risks)
- Emergency response plan informed by risk assessment
- Risk-based approach to identification and assessment of proactive risk mitigation opportunities
- Continuous improvement within a risk management framework



*Adapted from DHS/EPA Water and Wastewater Systems Sector-Specific Plan (2015)

AWIA Execution Lessons Learned

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Lessons Learned - General





AWIA Scope and Recertification

- Requirements apply only to water utilities; framework is applicable to all types of utilities
- Taking an “all hazards approach” is very important
- RRA ≠ VAs by another name
- RRAs → RMPs → ERPs
- Importance of regular updating (minimum requirement: every 5 years)

Recommended Utility Resources

- Appropriate management personnel and cross-section of system/technical experts
- Good management development opportunity
- Good training options are available from the EPA and AWWA (e.g., AWWA Risk and Resilience Certificate Program - EL260+)



Document Management

- Critical information – adequate protection measures need to be taken
 - Secure filesharing
 - Use passwords
 - Consider use of Non-Disclosure Agreements
- Communicate and enforce data management strategies to be used
- Elected officials – need to balance informational value vs. FOIA realities

Lessons Learned – Risk and Resilience Assessments



Q

What will risk and resilience assessments cover?

Risks to the system: from malevolent acts and **natural hazards**

Assets/systems: **resilience** of all physical assets from **source water** to distribution system, **(including security of)** electronic, computer and automated systems

A

Assessment of: **monitoring practices, financial infrastructure**, chemical use, storage and handling, and O&M of the system

May include evaluation of capital and operational needs

Focus broadened from terrorism to all-hazards



Risk and Resilience Assessment

- Interpretation of intent and requirements of AWIA still requires management judgement
- Most common reference documents:
 - Risk Analysis and Management for Critical Asset Protection (RAMCAP®) Standard for Risk and Resilience Management of Water and Wastewater Systems (ANSI/AWWA J100-10 (R13)), July 2010)
 - Baseline Information on Malevolent Acts for Community Water Systems (EPA, July 2019)



J100 7-Step Process

1

ASSET CHARACTERIZATION

What assets do I have and which are critical?

2

THREAT CHARACTERIZATION

What threats and hazards should I consider?

3

CONSEQUENCE ANALYSIS

What happens to my assets if a threat or hazard happens?

5

THREAT ANALYSIS

What is the likelihood that a hazard will strike my facility?

4

VULNERABILITY ANALYSIS

What are my vulnerabilities that would allow a threat or hazard to cause these consequences?

6

RISK AND RESILIENCE ASSESSMENT

What is my current level of risk and resilience?

7

RISK AND RESILIENCE MANAGEMENT

What options do I have to reduce risks and increase resilience? What are the benefits and costs?

Risk and Resilience Assessment – Asset Considerations

- Previous VAs can be useful ... to a point
- Identify reasonable number of Threat-Asset Pairs (TAPs)
- Critical assets
 - Consider defining at a system level
 - Do not include back-up or other redundancy-related measures

Definition of Critical Asset (*Source: J100*)

An asset whose absence or unavailability would significantly degrade the ability of a utility to carry out its mission or would have unacceptable financial or political consequences for the owner or the community.

Risk and Resilience Assessment – Threat Considerations

Natural Hazards

- Management judgment and experience is critical
- Use state and federal sources of information on different types of natural hazards (e.g., USGS, FEMA, NOAA)



Risk and Resilience Assessment – Threat Considerations

Malevolent Acts

- EPA's baseline information:
 - Starting point likelihood estimates for different types of threats
 - Tend to be conservative
 - Adjust as appropriate
- Many utilities and EPA believe insider threats >> than outsider threats
- Need to understand how security-related subcategories (deterrence, detection, delay, and response) and how they relate to vulnerability score



Risk and Resilience Assessment – Threat Considerations

Cybersecurity

- Include both SCADA and Enterprise Systems (Finance, Billing, CIS)
- Maintaining the same measures of consequence, vulnerability, and likelihood allows comparison of all risks equally
- Most common reference documents:
 - NIST Cyber Security Framework 1.1 for IT/Enterprise Systems
 - AWWA Cybersecurity Guidance and Assessment Tool 2.0 for OT/SCADA

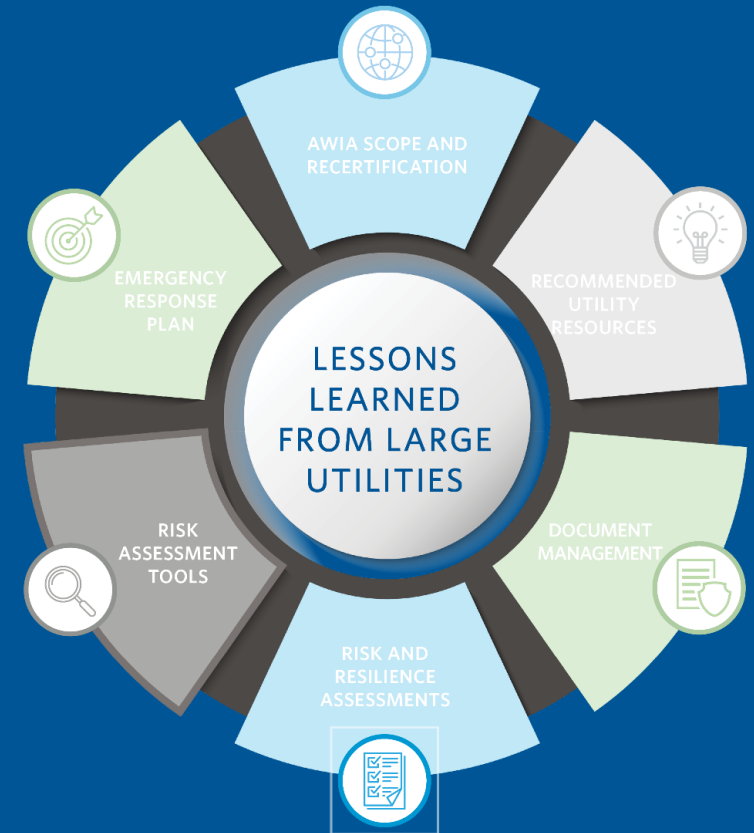


Risk and Resilience Assessment – Risk Mitigation Plans

- Broad array of countermeasures should be considered, including organizational
- Utility Resilience Index (URI) can provide useful information (operational- and financial-related resilience measures
- Develop “implementation initiatives” (costs, prioritization, schedule)



Lessons Learned – Risk Assessment Tools



Risk Assessment Tools

- **Most common risk assessment tools:**
 - EPA Vulnerability Self -Assessment Tool (VSAT Web 2.0)
 - EPA Guidance for Small Community Water Systems on Risk and Resilience Assessments
 - Utility Resilience Index (URI)
 - Utility or consultant-developed spreadsheet tools
 - AWWA Cybersecurity Guidance and Assessment Tool 2.0 for OT/SCADA
 - NIST Cyber Security Framework 1.1 for IT/Enterprise Systems



EPA Guidance for Small Community Water Systems on Risk and Resilience Assessments

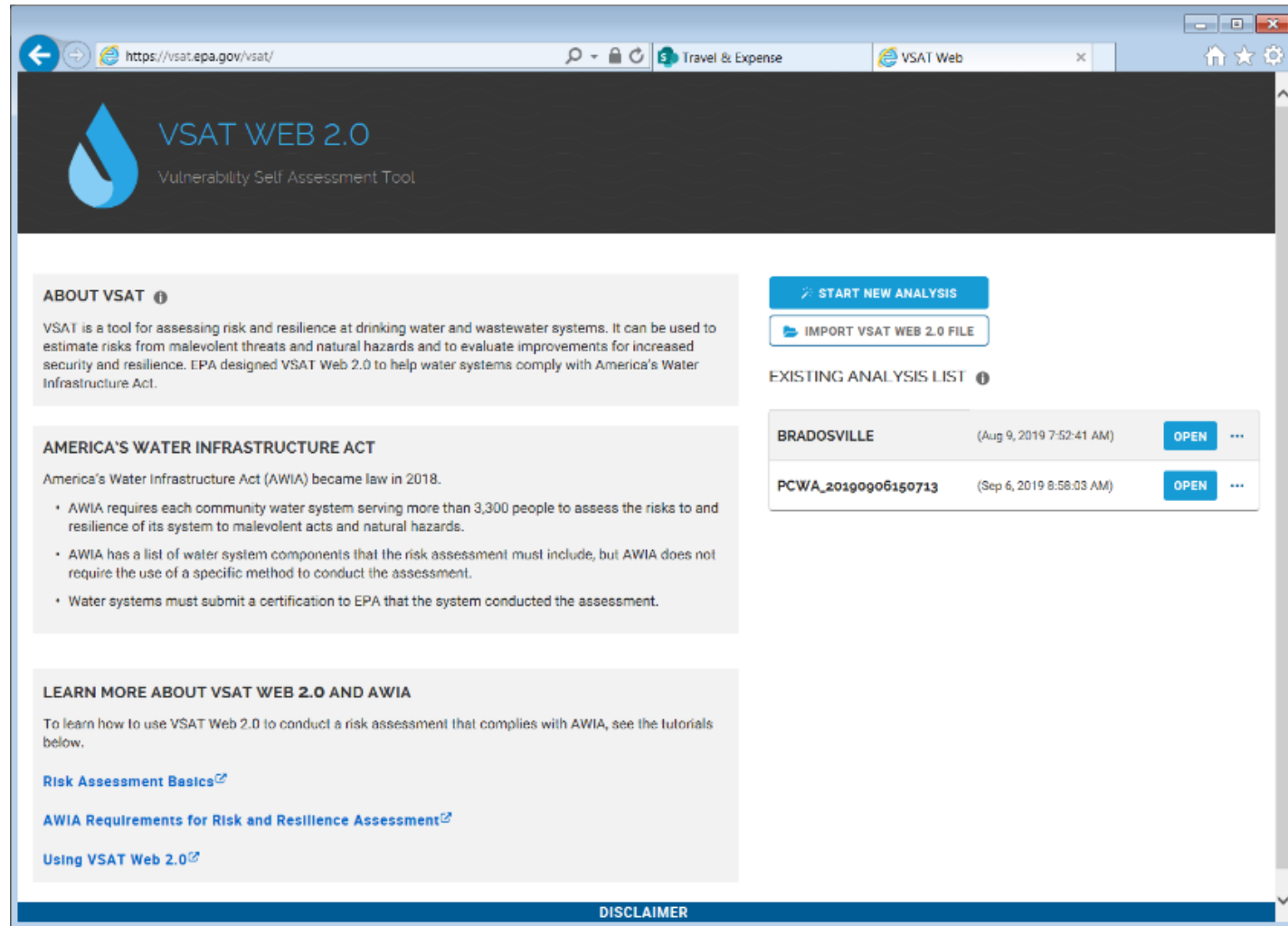
Table 4b: Pretreatment and Treatment (Natural Hazards)

Asset Category: Pretreatment and Treatment Examples of Assets in this Category: Encompasses all unit processes that a water system uses to ensure water meets regulatory public health and aesthetic standards prior to distribution to customers. Possible examples include sedimentation, filtration, disinfection, and chemical treatment. For the risk assessment, individual treatment processes at a facility may be grouped together and analyzed as a single asset if they have a similar risk profile.	
Natural Hazards Select the natural hazards in the left column that pose a significant risk to this asset category at the CWS.	Brief Description of Impacts If you select a natural hazard in the left column as a significant risk to the <i>Pretreatment and Treatment</i> asset category, briefly describe in the right column how the natural hazard could impact this asset category at the CWS. Include effects on major assets, water service, and public health as applicable.
<input type="checkbox"/> Flood	
<input type="checkbox"/> Earthquake	
<input type="checkbox"/> Tornado	
<input type="checkbox"/> Ice Storm	
<input type="checkbox"/> Fire	
<input type="checkbox"/> Other(s), enter below: <div></div>	

- Intended for small community water systems serving less than 50,000 people
- Checklist approach (fillable pdf or word document available)
- Description of potential impacts by critical asset and threat
- List of countermeasures (optional)

EPA VSAT WEB 2.0

- Web-based tool for assessing risk and resilience
- Resilience assessment at utility level (URI)
- Risk assessment follows the J100 process
- Consequence analysis uses the EPA WHEAT engine
- Baseline risk monetized to \$/year
- Provides a pdf report



Resilience Assessment

- **Utility Resilience Index (URI) – a score between 0 – 100%**

Operational Indicators

- O1: Emergency Response Plan (ERP)
- O2: National Incident Management System (NIMS) Compliance
- O3: Mutual Aid and Assistance
- O4: Emergency Power for Critical Operations
- O5: Ability to Meet Minimum Daily Demand (Water) or Treatment (Wastewater)
- O6: Critical Parts and Equipment
- O7: Critical Staff Resilience

Operational indicators reflect the utility's tactical capacity to react quickly and/or cope with various incidents that have the potential to disrupt service.

Financial Indicators

- F1: Business Continuity Plan (BCP)
- F2: Utility Bond Rating
- F3: GASB Assessment
- F4: Unemployment
- F5: Median Household Income

Financial indicators reflect the utility's fiscal capacity to react quickly and/or cope with various incidents that have the potential to disrupt revenue and costs.

Utility or Consultant-developed Spreadsheet Tools

- **Large systems**
- **Large amount of data available**
- **Ability to customize criteria and easily update data**
- **Query, summarize, report results**
- **Integration with other systems**

AWIA Assessment - Home Page

Utility Name: _____

Public Water System (PWS) ID Number (S) _____

Street Address _____

City _____

State _____

ZIP _____

Served population in PWS (2010) _____

Served population in subsequent systems (p/ Whitewater) _____

Population Served (Total) _____

Ownership _____

Average Water Demand (2002) _____

Average Water Rate (\$/1000 gal) _____

Prepared By _____

Date Completed: _____

VERSION TRACKING

Revision Number	Date Changed	Changed By	Description of Change
1			Created Version

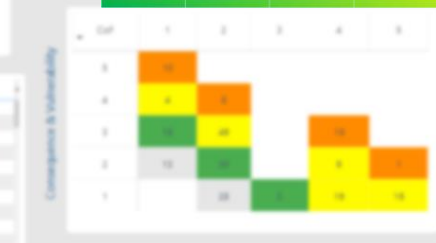
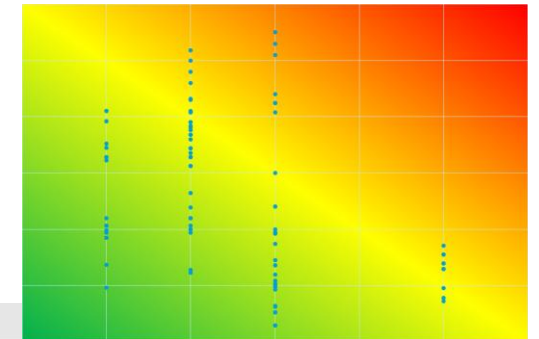
Navigation Buttons and Tab Color Key	Home	Overall Instructions	Overall Scoring
	Instructions	Consequence vs. Usefulness of Failure	Consequence vs. Probability
	Form		
	Data Results		
	Graphical Results	Consequence vs. Vulnerability	Selected Charts
Reference Material			
URI Instructions	Consequence Instructions	Vulnerability Instructions	
URI Criteria	Threat Inventory	Vulnerability Terminology	
URI Form	Consequence Criteria	Vulnerability Criteria (Malicious Acts)	
	Consequence Form	Vulnerability Criteria (Data C/P)	

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The screenshot displays the 'AWIA Threat Assessment Dashboard'. It features a top navigation bar with a home icon and the dashboard title. Below the navigation bar, there are four main content areas arranged in a 2x2 grid:

- Threat Summary:** Displays a warning icon, the text '22 Threats', and a 'Threats' link.
- Asset Summary:** Displays a network icon, the text '22 Assets', and an 'Assets' link.
- Threat-Asset Pair Summary:** Displays a warning icon with a network connection, the text '22 Pairs', and a 'Pairs' link.
- Asset Scoring Explorer:** Displays a magnifying glass icon and an 'Explorers' link.

On the right side of the dashboard, there is a map of the Greater London area, showing various districts and landmarks. The map is titled 'Greater London' and includes a legend for 'Threats' and 'Assets'.





Advantages of NIST/NCSR for IT/Enterprise Systems

- Focused on enterprise systems. Can be used for SCADA as well.
- Some utilities have already used the NCSR to meet a DHS grant program requirements
- For HIPAA compliant organizations, can translate the NCSR scores to HIPAA Security Rule scores
- National NCSR database allows baseline comparison

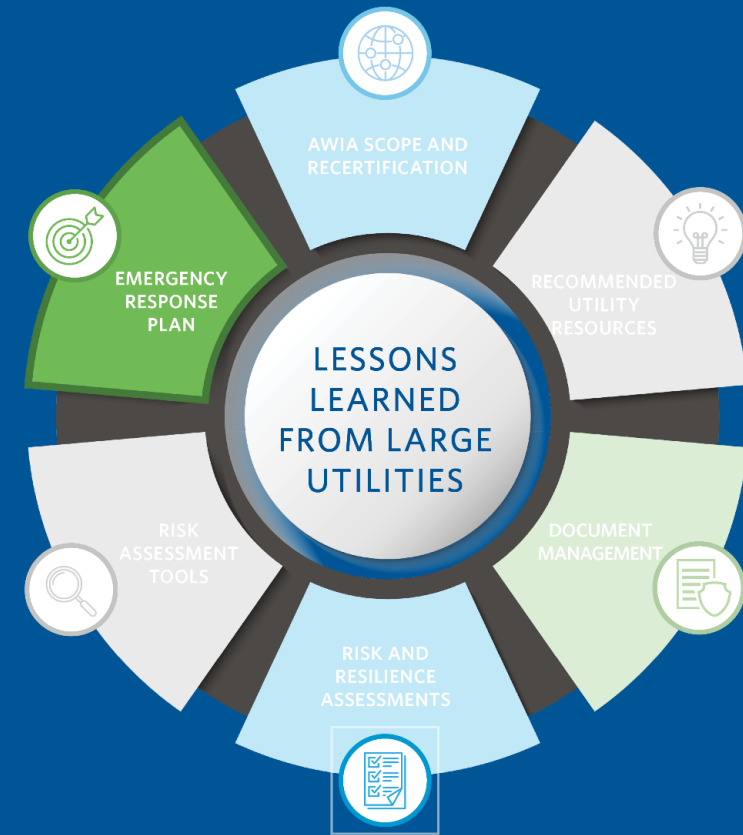
Advantages of AWWA for OT/SCADA Systems

- Focused on industrial control systems (SCADA) with some enterprise questions.
- SCADA terms and examples are used in the questions
- Easily maps to J100 and VSAT

Both are self assessments, 100+ questions
Scanning of networks / penetration testing if desired



Lessons Learned – Emergency Response Plans



Q

What should emergency response plans cover?

A

Strategies and Resources

- Roles and responsibilities, Incident Command System, communications

Emergency Plans and Procedures

- Response plans and procedures (core and incident specific), list of equipment

Risk Mitigation Actions

- Alternative source water, interconnections, redundancy improvements, asset hardening, physical and cybersecurity countermeasures

Detection Strategies

- Intrusion detection, source water contamination, cyber intrusion, chemical release, etc.

Emergency Response Plans

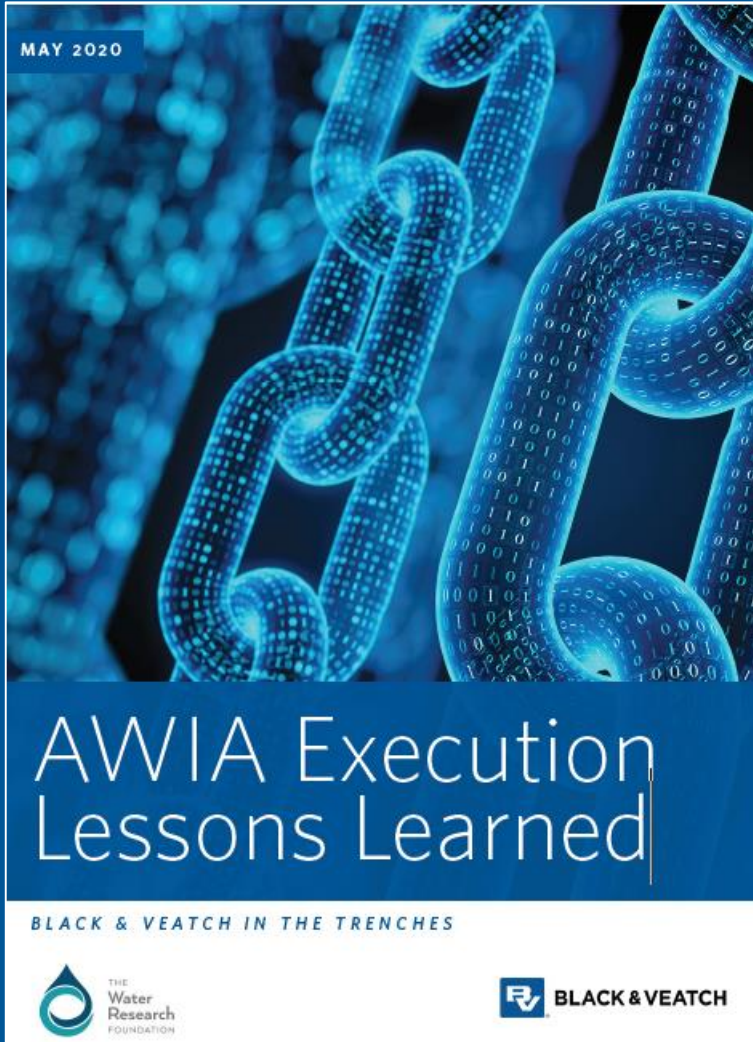
- Most common reference documents:
 - Emergency Planning for Water and Wastewater Utilities (AWWA, M19, 2018)
 - EPA Emergency Response Plan Template and Instructions
 - EPA Incident Action Checklists for Water Utilities
- Consider state regulatory requirements
- Update annually or after each major event or significant change

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Community Water System Emergency Response Plan Template and Instructions

https://www.epa.gov/sites/production/files/2019-07/documents/190712-awia_erp_template_instructions_kab_508c_v6.pdf



Additional Resources on RRAs and ERPs

- EPA – AWIA Section 2013 Technical Assistance Primer
- EPA – Risk Assessment and ERP Requirements Training
- AWWA Utility Risk and Resilience Certificate Program
- WRF 5014 – AWIA Execution Lessons Learned

<https://www.waterrf.org/resource/awia-execution-lessons-learned>

Key Takeaways

The background of the slide is a solid black field. Overlaid on this is a complex pattern of small, bright blue dots. These dots are arranged to form a series of overlapping, wave-like or mesh-like structures that curve upwards from the bottom left towards the right side of the frame. The density of the dots varies, creating a sense of depth and movement.

Key Takeaways

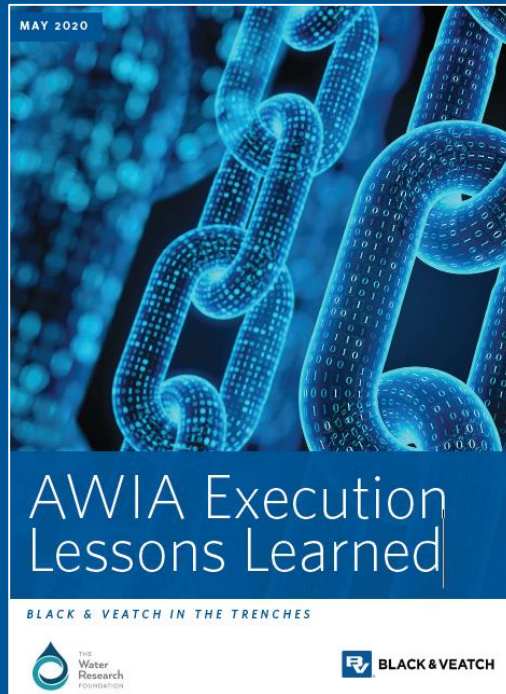
- Start early
- Get the right managerial/technical resources in place
- RRA ≠ VAs by another name
- RRAs → RMPs → ERPs (RMP level of detail/timing)
- Match tools and approach to the size and complexity of your organization
- Use of AWWA and EPA guidance documents and tools is great place to start
- Leverage the experience of others



WRF 5014 PROJECT DELIVERABLES AND DEADLINES

Deliverable	Deadline
Case Studies	October 2020
Practical Framework	December 2020
Final Project Presentation	February 2021

Please check WRF 5014 website for updates



For More Information Regarding Execution Lessons Learned

- BV's AWIA Execution Lessons Learned Guide
 - <https://www.waterrf.org/system/files/resource/2020-06/ProjectPaper-5014-2.pdf>

Draft Literature Review

WRF Project 5014



There are numerous guidance documents, standards, frameworks, and tools available to water utilities covering the various aspects of risk and resilience planning and emergency preparedness. Black & Veatch conducted a literature review of the most relevant regulations, guidelines, frameworks, and models/tools that exist. A description of each and a discussion of specific elements, their applicability, pros/cons, etc. were compiled. This draft review is currently being reviewed by WRF, PAC, and this project's participating utilities.

Forty-nine, one- to two-page document summaries are shown in the table below, followed by the actual summaries.

Table 1 Document Summary

REF. NO.	DOCUMENT REF. NO.	DOCUMENT TITLE	TYPE OF DOCUMENT	INDUSTRY	FOCUS AREA
01	G-AWWA-CSRMG	AWWA Water Sector Cybersecurity Risk Management Guidance	Guideline/Framework	Water	RRA Cybersecurity
02	R-SDWA-XIV	Safe Drinking Water Act	Regulation	Water	General
03	G-NIST-SF800-82	NIST Guide to Industrial Control Systems (ICS) Security	Guideline/Framework	General	RRA Cybersecurity
04	G-NIST-CSWP	NIST Framework for Improving Critical Infrastructure Cybersecurity	Guideline/Framework	General	RRA Cybersecurity
05	G-EPA-WSH	A Water Security Handbook: Planning for and Responding to Drinking Water Contamination Threats and Incidents	Guideline/Framework	Water	General
06	T-AEM-PARRE	AEM Corp PARRE for J100 Tool	Tool	General	General
07	G-AWWA-PWSCII	AWWA Protecting the Water Sector's Critical Infrastructure Information	Guideline/Framework	General	General

BV's Resilience Literature Review Summary

- <https://www.waterrf.org/system/files/resource/2020-05/ProjectPaper-5014-1.pdf>

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