



WaterISAC

www.waterisac.org

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AMERICAN WATER

Maintaining Security of Our Water Utilities

Nicholas W. Santillo Jr.
Director, Physical and Cyber Security
American Water

National Association of Regulatory Utility Commissioners
2/16/16

Who Is American Water

We are the largest publicly traded water and wastewater utility in the United States

- Broad national footprint and strong local presence
- Services to an estimated 15 million people in more than 1,500 communities in more than 45 states and parts of Canada
- Approx. 6,600 dedicated and active employees
- Treats and delivers more than one billion gallons of water daily



Regulated Water Utility Must Balance ...



The Goldilocks Dilemma





TOO MUCH

NOT ENOUGH



Is the protective measure cost effective?

- **Questions to ask?**
 - Does it benefit the customer?
 - Prioritized based on risk?
 - Balanced against business needs and cost of service?
 - Consistent with industry and company standards?
 - Are the results measurable?



Water And Wastewater Utilities At High Risk Of Cyberattack

By Sara Jerome
@sarmje

Cyberattacks pose a greater threat to water and wastewater utilities than most other industrial sectors.

Federal cybersecurity overseers at the Homeland Security Department say they received 159 reports last year involving "vulnerabilities in control systems components. The majority of vulnerabilities that were coordinated involved systems most commonly used in the Energy Sector, followed by Critical Manufacturing and Water and Wastewater."

Of all the 245 cyber threat incidents reported by asset owners and asset managers in the sector.

Wastewater and water utilities are drawing an increasing amount of onsite cybersecurity assessments conducted by ICS-CSSA, a Department, is on the rise. It conducted 25 in 2011, 72 in 2013, and 100 in 2014. Cybersecurity assessments within the wastewater and water sectors are also on the rise.



Defending SCADA systems against the growing cyber threat

Kathleen Wolf Davis | Jun 01, 2015

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By Dave Chronister

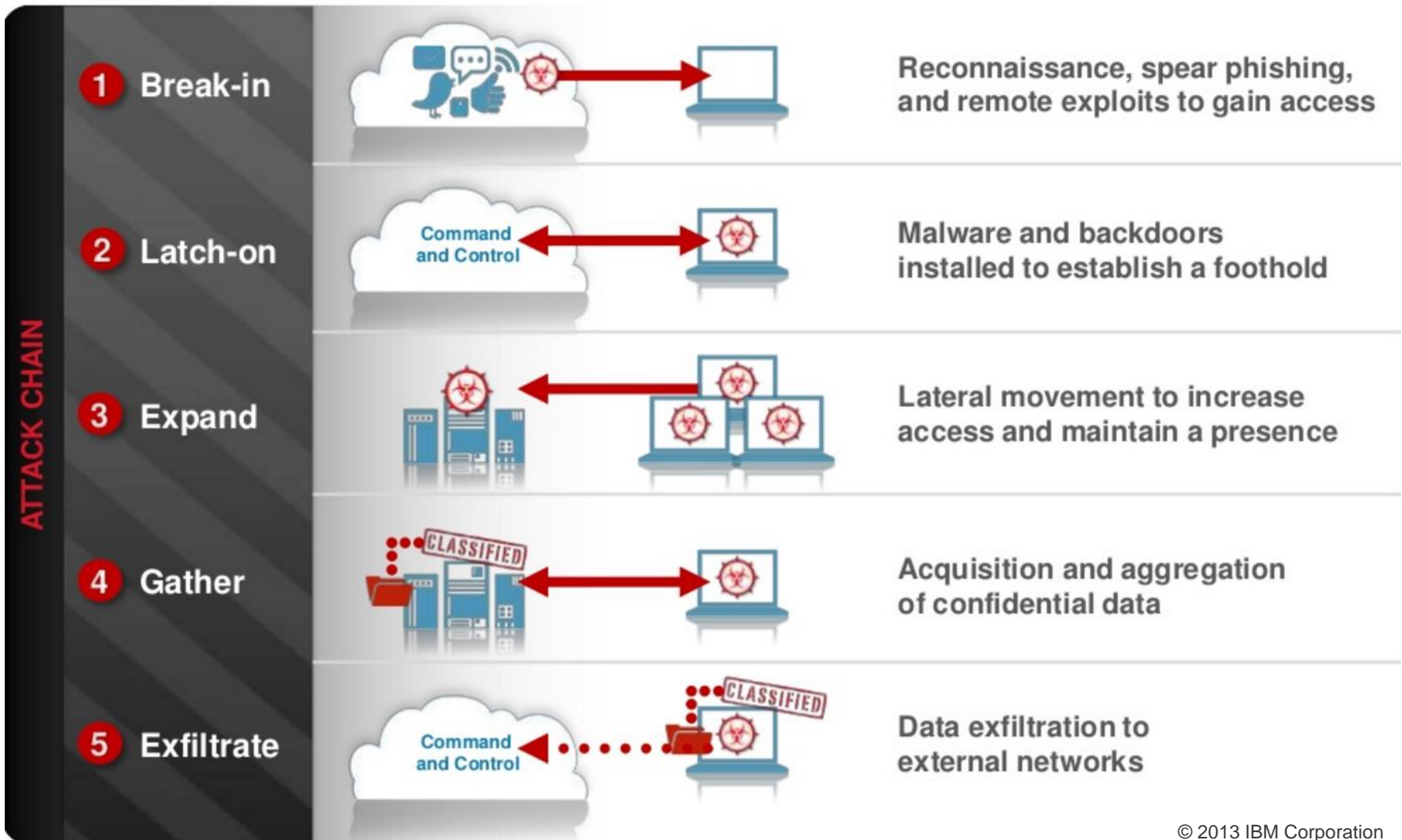


Cyber threats against the electric grid are escalating dramatically.

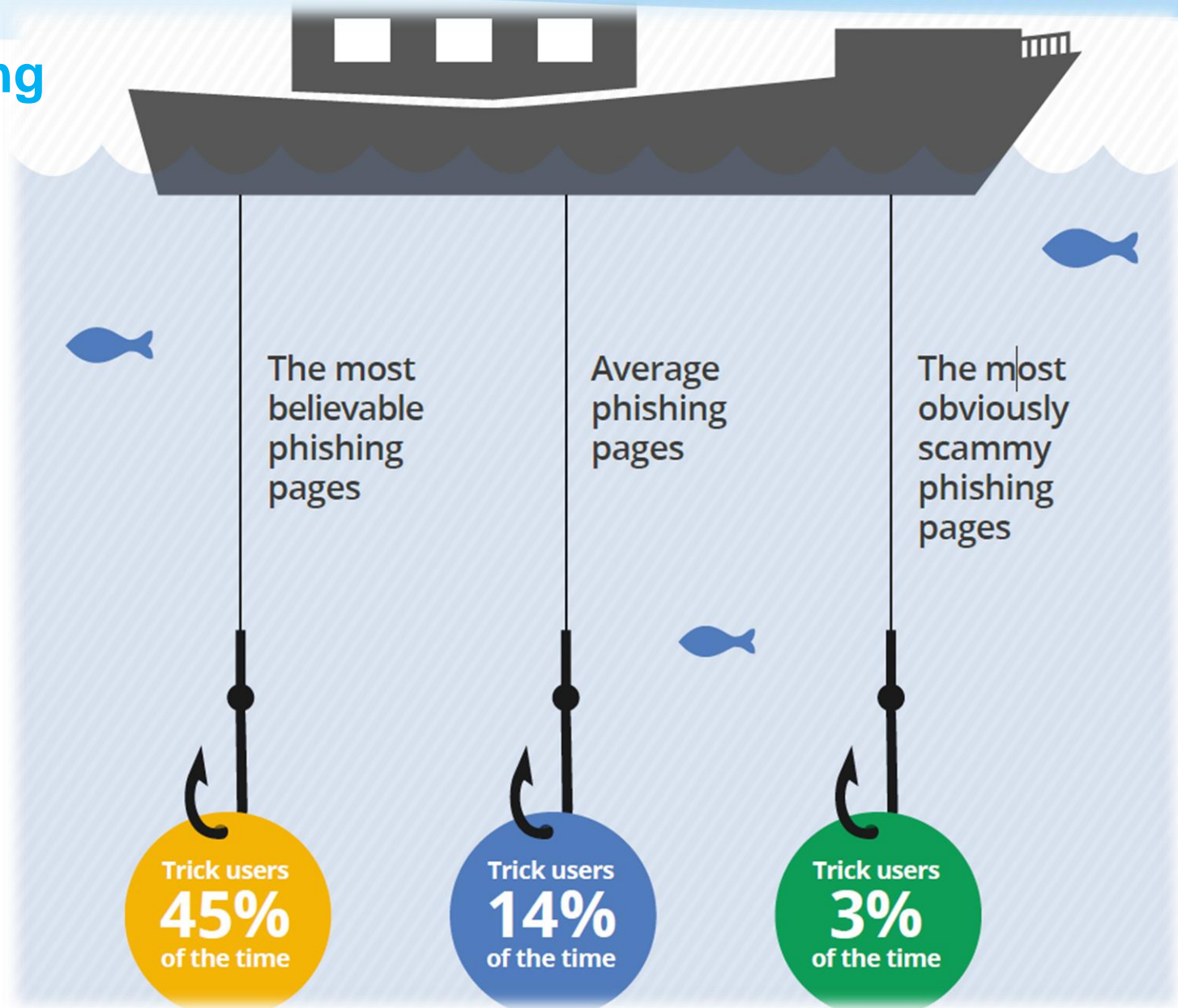
According to a new report by Dell Security, cyber attacks on supervisory control and data acquisition (SCADA) systems doubled last year--and they've increased 600% since 2012. As

alarming as those statistics are, another key finding is even more troubling--physically disruptive attacks are becoming increasingly common. In fact, 25% of all cyber incidents last year were a specific type of attack that can flood SCADA systems and shut down mechanical devices, potentially disrupting physical operations. These attacks are expected to worsen over the next few months and years--and the US is the third most targeted country in the world. The Department of Homeland Security's

Advanced attackers follow a five-stage attack chain



Phishing



NIST – Cyber Security Framework

Identify

Protect

Detect

Respond

Recover

CONFIDENTIALITY

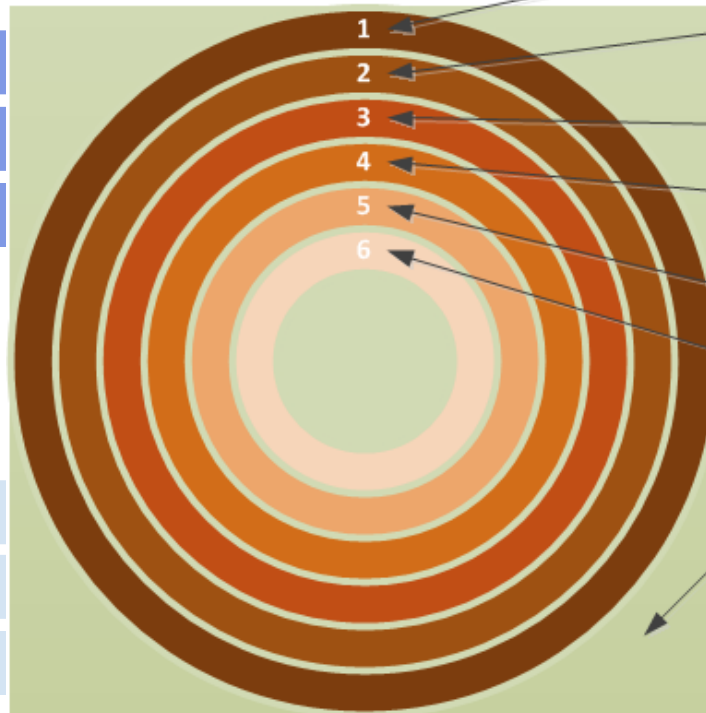
INTEGRITY

AVAILABILITY

PEOPLE

PROCESS

TECHNOLOGY



TECHNICAL CONTROLS

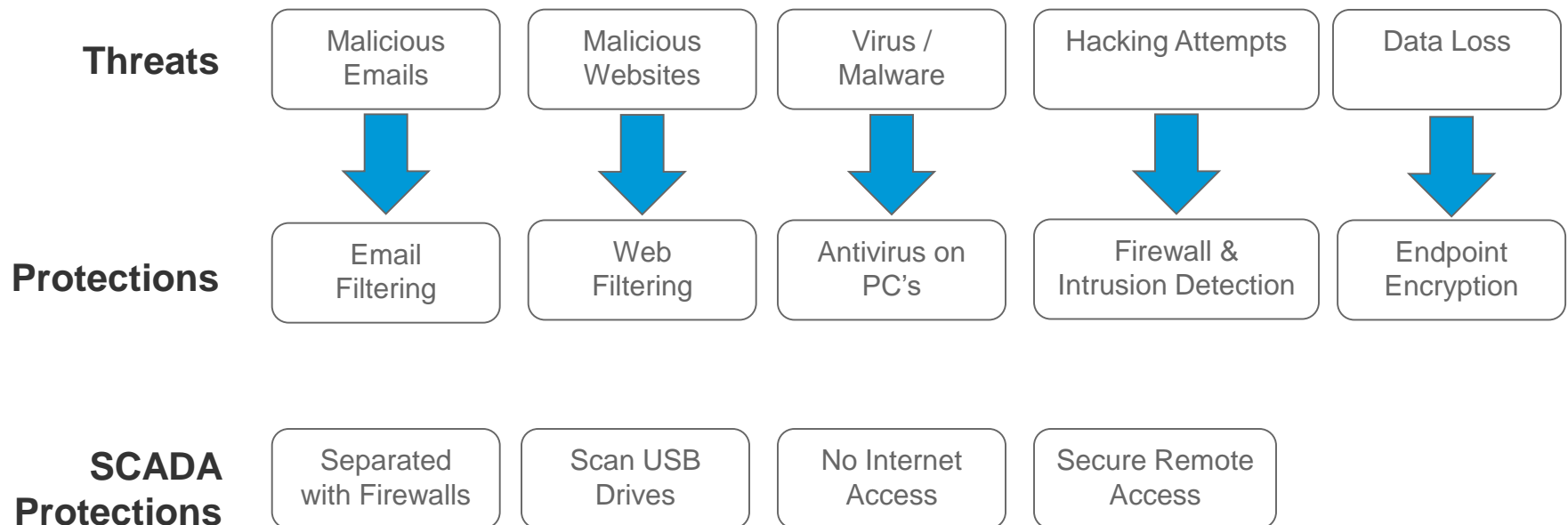
- 1. Physical Perimeter**
(Fencing, Access Control, Intrusion Detection)
- 2. Virtual Perimeter**
(Remote Access, VPN, 3rd Party Access, Content Filtering, Intrusion Detection)
- 3. Network Architecture**
(Firewalls, Routers, Switches, Zones/Conduits)
- 4. Business Systems**
(Application, Operating System, Encryption, Data Loss Prevention, Anti-Virus)
- 5. Process Information**
(Access, Historians, Intrusion Detection, Anti-Virus)
- 6. Process Control Systems**
(OPC, HMI's, PLC's, Process Control Equipment)

PROCEDURAL CONTROLS

- Across all Six Layers spans procedural controls.
- Governance, Security Policies, Practices, Procedures and System Ownership
 - Asset Inventory, System Documentation, Change Management, Test/Development Environment
 - Risk Management, Patch Management, Lifecycle Planning, Assessments
 - Incident Management, Backup/Recovery, Manual Operations Plans, Business Continuity

Defense In Depth Approach

Threats / Protections Examples



Six Questions for Leadership to Ask (ISACA)

1. Does the organization use a security framework?
2. What are the organization's top five cybersecurity risks?
3. How are employees made aware of their cybersecurity role?
4. Are external and internal threats considered when planning a cybersecurity program?
5. How is cybersecurity oversight managed in the organization?
6. If a breach occurs, is there a strong response protocol

Standards and Guidelines

- **American Water Works Association**
 - Security Practices for Operation and Management (G-430)
 - Risk and Resilience Management of Water and Wastewater Systems (J-100)
 - Emergency Preparedness Practices (G-440)
- **ASIS**
 - Security Management Standard: Physical Asset Protection (2012)
 - ASIS/BSI Business Continuity Management Standard (2010)
- **Cyber**
 - ISA99 – Industrial Control System Security
 - SANS – 20 Critical Security Controls
 - NIST Cybersecurity Framework
 - AWWA – Process Control System Security Guidance for the Water Sector



Emergency Response Tools and Resources

**2016 NARUC Winter Meetings
February 16, 2016**

Kevin Tingley, P.E.

USEPA OGWDW, Water Security Division

Outline

1. All Hazards Boot Camp Training
2. Response On-The-Go
3. Climate-Ready Water Utilities
4. Relationships Between Sectors
5. Flood and Drought Resilience
6. Hazard Mitigation
7. Public Awareness Kit

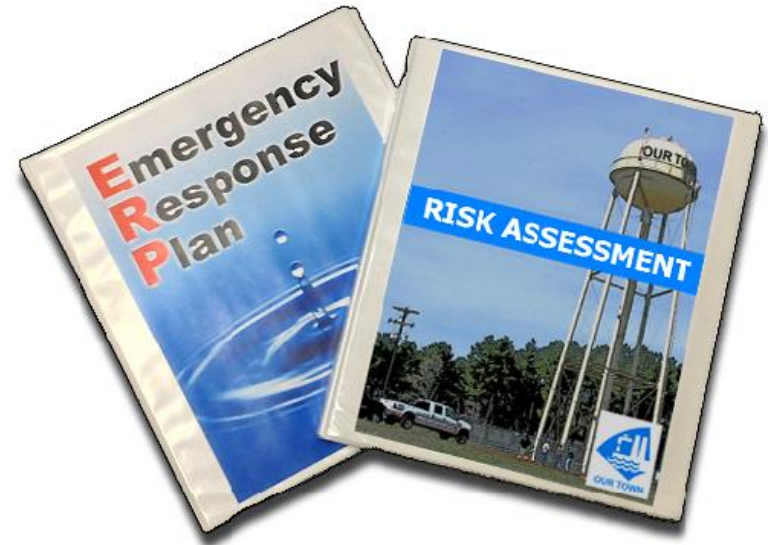


<http://www.epa.gov/waterresilience>

All-Hazards Boot Camp Training

Education is Key

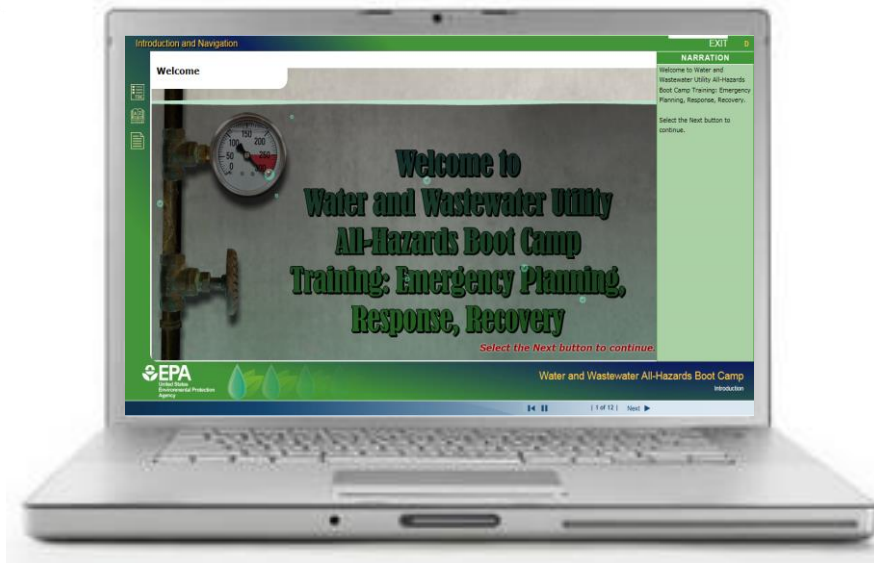
- Designed for water and wastewater employees who are responsible for preparedness, response and recovery activities
- Explains why and how to implement a comprehensive all-hazards program
- Provides resources that are available to assist in the process



All-Hazards Boot Camp Training

Get CEUs!

- Approved by most states for 2 training hours or 0.2 credits
- Users receives a Certificate of Completion



State Program Approvals		
DW & WW	DW	WW
AK, AL, AR, AZ, DE, FL, IA, KY, LA, MD, ME, MT, MO, MS, NC, NE, NJ, NM, *ND, **OH, SD, TN, VT, WV, WI, WY	HI, IL, IN, MN, RI, UT	CT, NH, MI

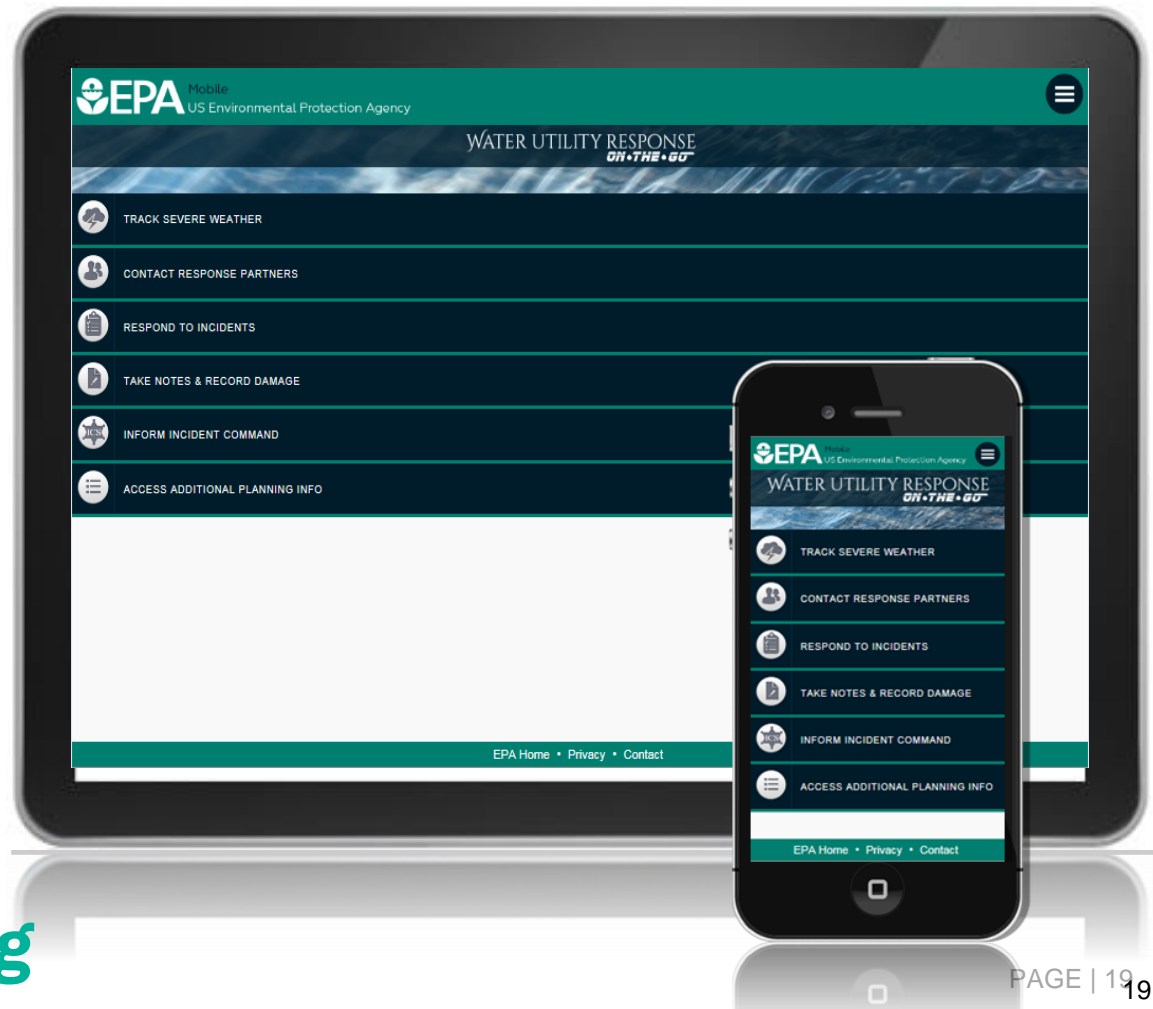
*ND – 1.0 CEC

**OH – 1.5 hours



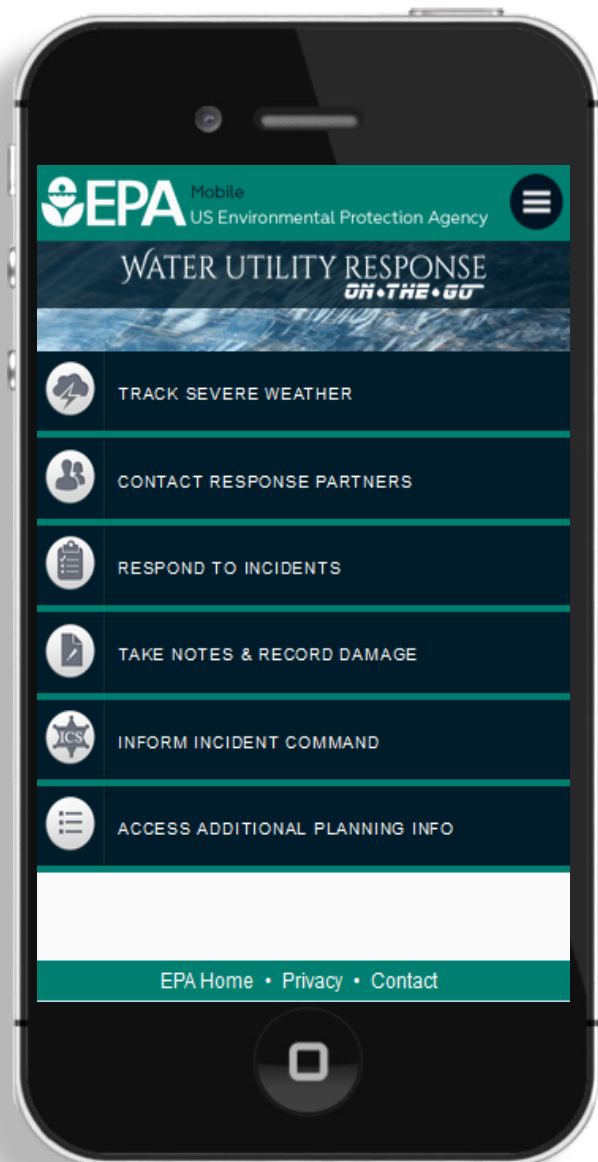
Water Utility Response *On-The-Go!*

Use Today's
Technology for
Tomorrow's
Response!



epa.gov/responseotg

Water Utility Response *On-The-Go!*



Goal: Create a one-stop-shop for the most important information needed for utility personnel *responding* to a water-related incident

What can it help me do?

1. Increase situational awareness and coordination

- Severe weather forecasting tools
- Emergency contacts for regional, State and Federal partners
- Incident Command features

2. Take and track key response actions

- Incident action checklists for a variety of natural hazards

3. Assess damage from the field

- Quick and easy generic forms

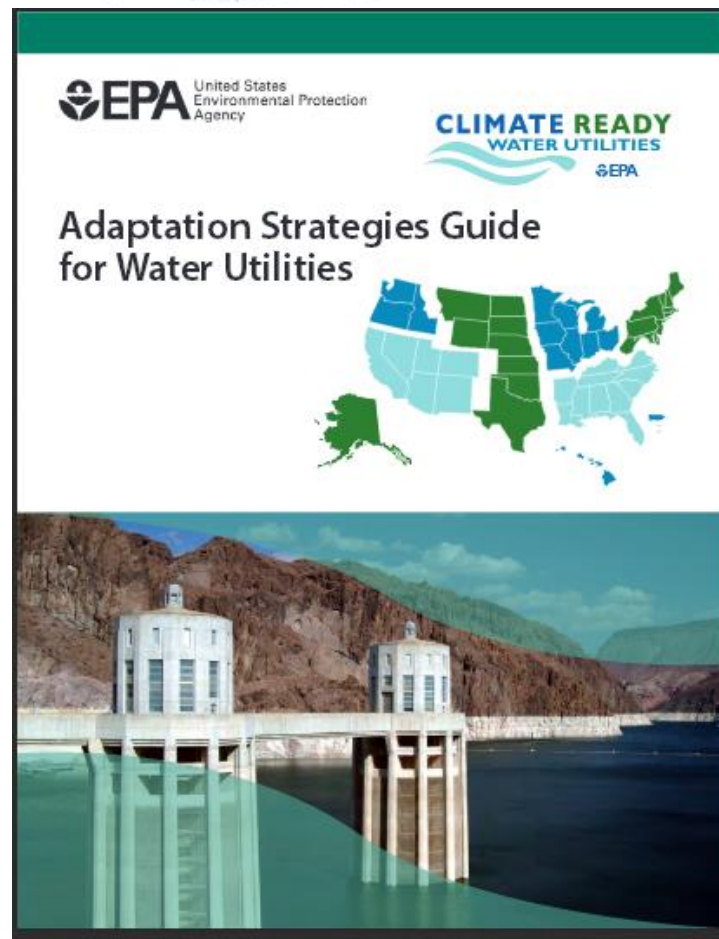
Type into your browser:
epa.gov/responseotg

- Explore the tool
- Share it with colleagues



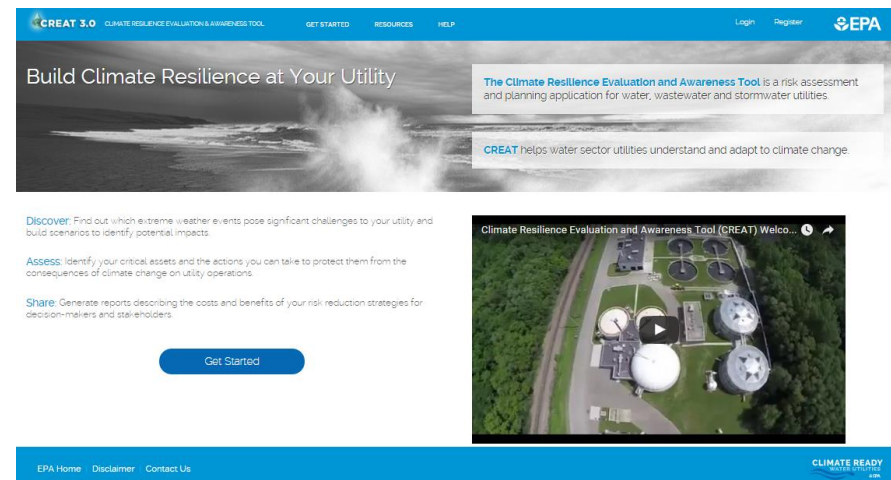
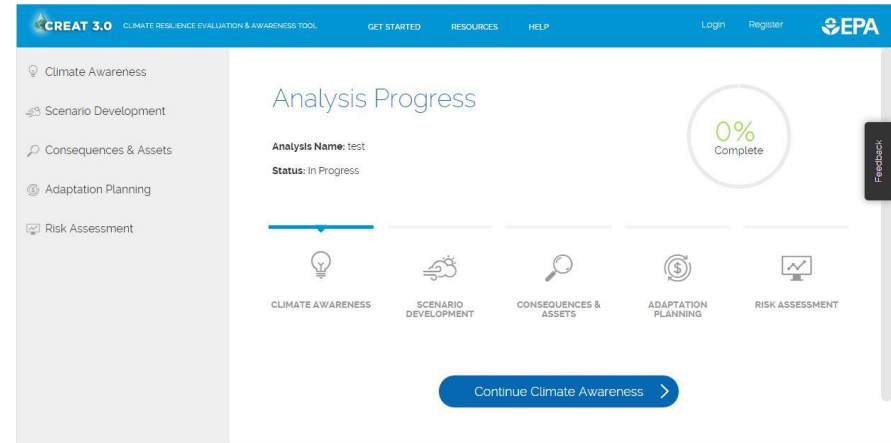
Adaptation Strategies Guide

- Guide for utilities to consider climate change in utility planning
- Easy-to-understand climate science, translating data into impacts for utilities
- Adaptation strategies related to impacts
- Recent updates
 - Sustainability Briefs
 - Updated climate data (2014 National Climate Assessment)
 - Expanded climate region briefs
 - Updated utility case studies



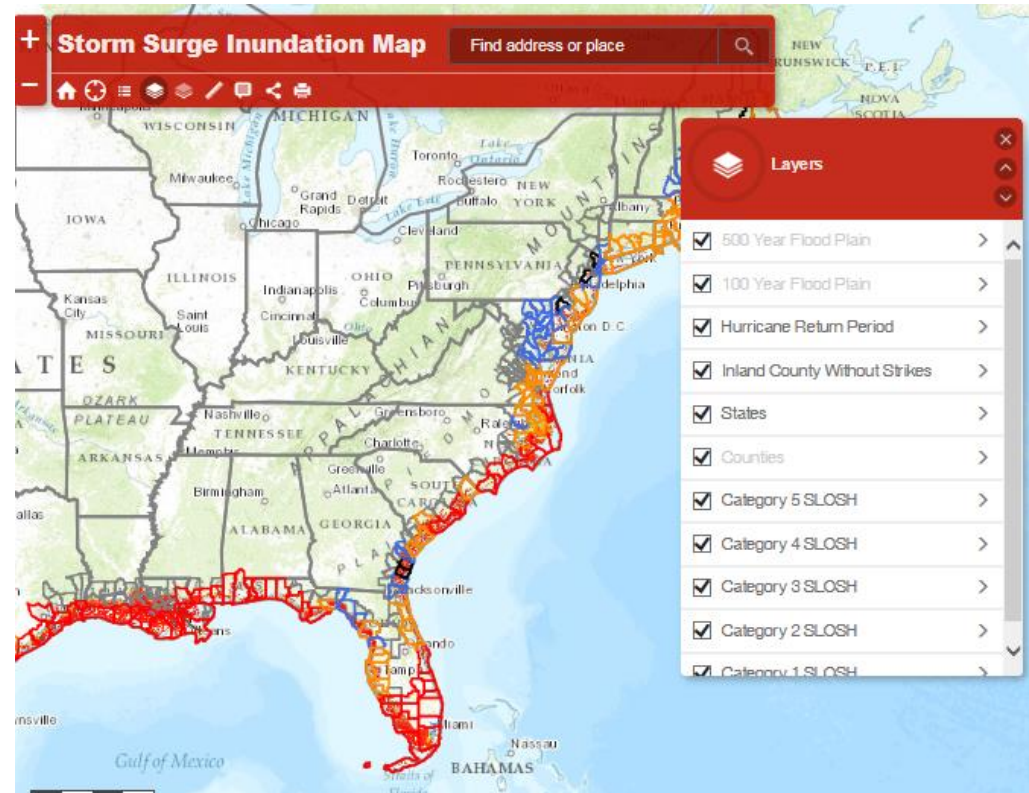
Climate Resilience Evaluation & Awareness Tool (CREAT)

- Web-based tool for conducting **risk assessment** of potential climate change impacts at your utility
- Multiple climate scenarios provided to help **capture uncertainty**
- Assessments will help inform **adaptation planning**
- Results from CREAT help utilities compare **monetized risk and adaptation costs**



Storm Surge Inundation and Hurricane Strike Frequency Map Overview

- Access current worst-case coastal storm surge scenarios and hurricane strike frequency information
- Layers include FEMA flood zones and inundation from Sea, Lake, and Overland Surge from Hurricanes (SLOSH) model results



Climate-Ready Water Utilities Website: www.epa.gov/crwu

Power Resilience Guide for Drinking Water and Wastewater Utilities

Purpose:

- Provide strategies to increase resilience to power loss
- Promote coordination between water and electric utilities



Increasing Power Resiliency

- **Communication**
 - Get utility on prioritization list for power restoration
- **Power Assessments**
- **Generators**
 - Buy, rent, or borrow?
 - Placement
 - Maintenance
- **Fuel**



Emergency Services

Identified ongoing issues between water utilities and members of the emergency services sector

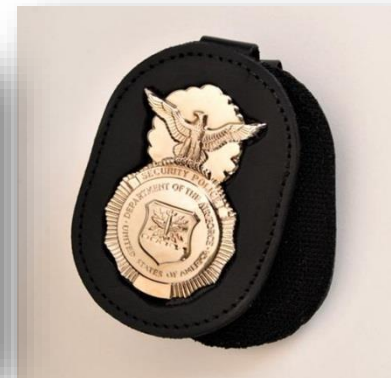
- Law Enforcement
- Fire and Emergency Services
- Emergency Management
- Emergency Medical Services
- Public Works



Lauren Wisniewski

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Healthcare and Public Health

- Workshops will focus on identifying ways to improve relationships between water utilities and healthcare and public health sectors.
- Work with members from both the healthcare and public health sectors, regions, states and water utilities to identify best practices and lessons learned.
- Planned Workshops (FY16)
 - Wallingford, Connecticut- June 8, 2016
 - Atlanta, Georgia-TBD
 - St. Louis, MO-TBD
 - 4th location- TBD

Chrissy Dangel

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Flood Resilience Guide



- Contains interactive worksheets, instructional videos, flood maps
- Designed for small and mid-sized utilities
- Lists practical mitigation measures by specific asset

www.epa.gov/waterutilityresponse/build-flood-resilience-your-water-utility

Drought Response and Recovery

Project Approach

- Captured lessons learned from six diverse case studies (varying location, system type, etc.) which helped to drive Guide content
- Worked with Water Sector Focus Group throughout Guide development



Case Studies Visits:

1. *Tuolumne Utilities District, CA
2. *Spicewood Beach Water System, TX
3. City of Las Vegas, NM
4. City of Hogansville, GA
5. Cities of Hays and Russell, KS
6. City of Clinton, OK

*Pilot utility: included in-depth assessment



Guide Home Page

DROUGHT RESPONSE AND RECOVERY

A Basic Resilience Guide for Water Utilities

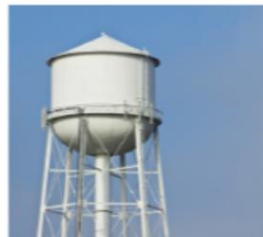
Select a menu option below. New users should start with Overview and Navigation.



Overview and Navigation



Staffing, Response Plans
and Funding



Water Supply and Demand
Management



Communication and
Partnerships



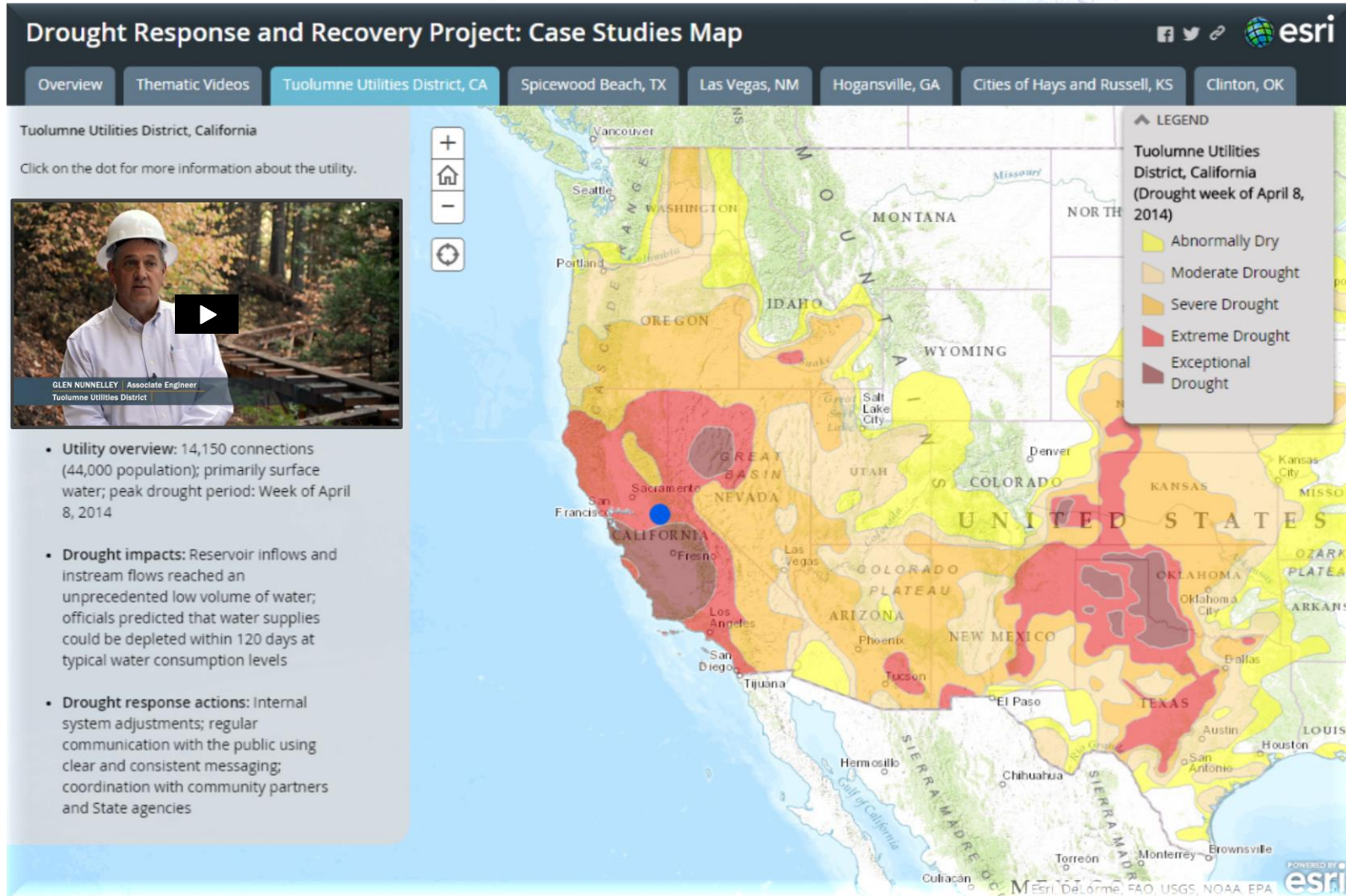
Case Studies and Videos



Next ►

Case Studies Map and Videos

Geoplatform – Tuolumne Utilities District, CA



Drought Response and Recovery Guide

Release and Outreach

Next Steps

- Available end of Feb. 2016
- Early December 2015 – Two Workshops
 - In Fresno, CA area as part of the National Drought Resilience Partnership (NDRP)
- FY16 – Planning additional outreach, trainings/workshops
 - Drought-Water Loss Workshops in Spring 2016



HAZARD MITIGATION FOR NATURAL DISASTERS

A Starter Guide for Water and Wastewater Utilities

Select a menu option below. New users should start with Overview Hazard Mitigation.



Overview
Hazard Mitigation



Join Local Mitigation
Efforts



Develop Mitigation
Projects



Implement and
Fund Project



Mitigation Case Study



Overview
Hazard Mitigation

Join Local
Mitigation Efforts

**Develop
Mitigation Projects**
Page 2 of 8

Implement
and Fund Project

Mitigation
Case Study

Develop Mitigation Projects for Various Natural Disasters

To help you develop mitigation projects, the following provides specific mitigation resources and examples for each natural disaster.



Flood



Earthquake



Drought



Wildfire



Tornado



Power Outage

Overview
Hazard Mitigation

Join Local
Mitigation Efforts

Develop
Mitigation Projects
Page 4 of 8

Implement
and Fund Project

Mitigation
Case Study



Earthquake Mitigation Resources

Resource	Description
Recent Earthquakes: Implications for U.S. Water Utilities	Potential impacts of earthquakes on water utilities and effectiveness of seismic upgrades of tanks, buildings, equipment, and pipes. (Water Research Foundation)
Oregon Earthquake Resiliency Plan	Mitigation measures for the anticipated Cascadia Earthquake. Chapter 8 addresses Water and Wastewater Systems. (Oregon Seismic Safety Policy Advisory Commission)
Seismic Guidelines for Water Pipelines	Overview of how to design and install pipelines to mitigate damage from earthquakes. (FEMA and the National Institute of Building Sciences)
Earthquake Hazard Mitigation for Utility Lifeline Systems	An overview of strategies for mitigation and response planning for utilities. (FEMA)
Incident Action Checklist -Earthquake	Checklist of activities that water and wastewater utilities can take to: prepare for, respond to and recover from earthquakes. (EPA)

Earthquake Mitigation Examples

- Seismic retrofit of pipes with flexible joints
- Reinforce settling tanks
- Harden or replace transmission lines with earthquake resilient designs
- Secure aboveground pipes
- Install earthquake shutoff valves



Secured pipes

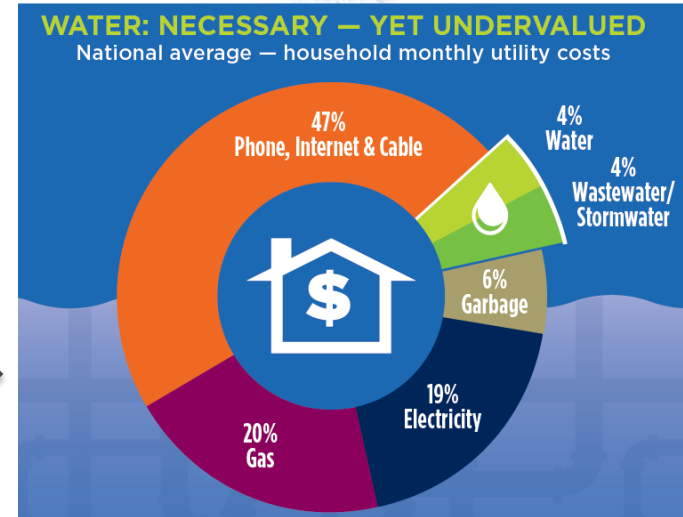


Reinforced basin

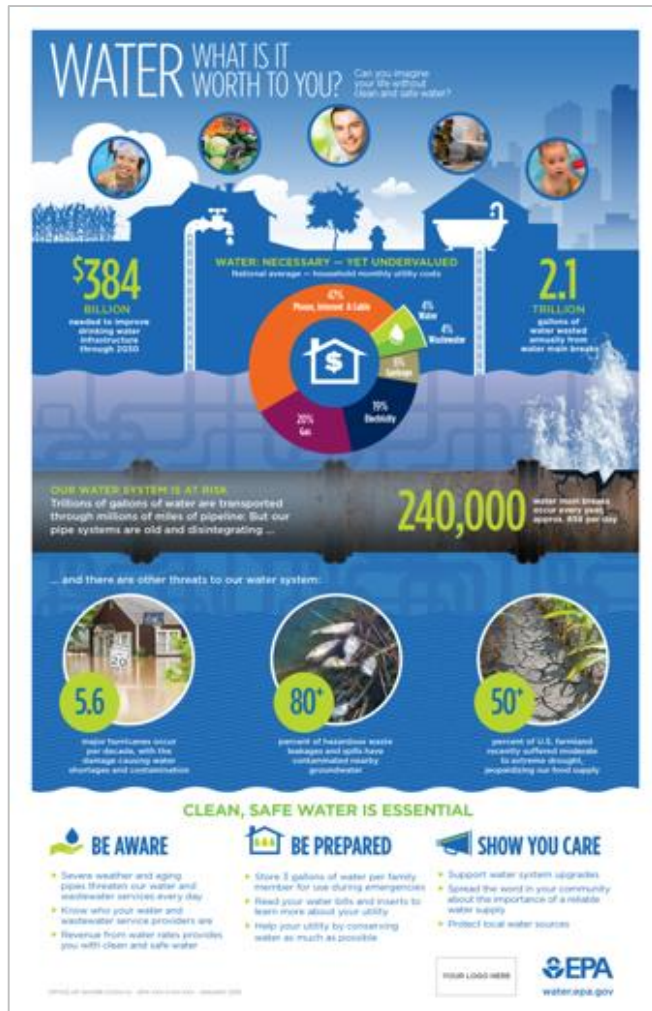
▶ Return to Natural Disasters Menu



Water Utility Public Awareness Kit

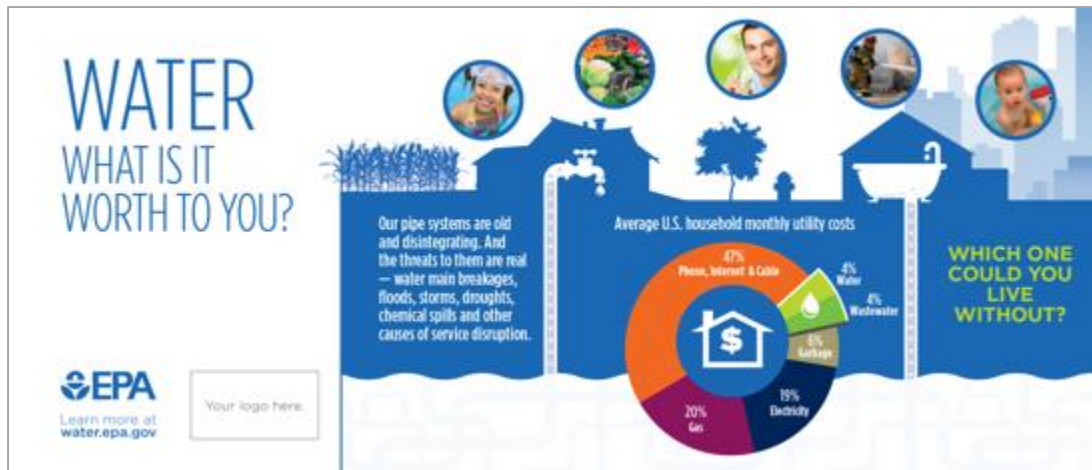


Tools To Improve Communications



1. Poster
2. Mail Inserts
3. Foldable Brochures
4. Video PSA
5. Web Graphic PSA
6. Print Graphic PSA
7. Radio PSA (coming soon)

Bill Inserts



CLEAN, SAFE WATER IS ESSENTIAL

BE AWARE

- ▶ Severe weather and aging pipes threaten our water and wastewater services every day
- ▶ Know who your water and wastewater service providers are
- ▶ Revenue from water rates provides you with clean and safe water

BE PREPARED

- ▶ Store 3 gallons of water per family member for use during emergencies
- ▶ Read your water bills and inserts to learn more about your utility
- ▶ Help your utility by conserving water as much as possible

SHOW YOU CARE

- ▶ Support water system upgrades
- ▶ Spread the word in your community about the importance of a reliable water supply
- ▶ Protect local water sources

EPA
Learn more at water.epa.gov

Your logo here.


EPA XXX-X-15-XXX January 2015

Brochure




WATER WHAT IS IT WORTH TO YOU?

Can you imagine your life without clean and safe water?




EPA
Learn more at water.epa.gov

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WHICH ONE COULD YOU LIVE WITHOUT?

Average U.S. household monthly utility costs

Utility	Percentage
Phone, Internet & Cable	47%
Electricity	19%
Gas	20%
Garbage	6%
Water	4%
Wastewater	4%

\$384 BILLION needed to improve drinking water infrastructure through 2030

2.1 TRILLION gallons of water wasted annually from water main breaks

OUR WATER SYSTEM IS AT RISK

Trillions of gallons of water are transported through millions of miles of pipeline. But our pipe systems are old and disintegrating —

240,000 water main breaks occur every year, approx. 658 per day

... and there are **OTHER** threats to our water system:



5.6 major hurricanes occur per decade, with the damage causing water shortages and contamination



80% percent of hazardous waste leakages and spills have contaminated nearby groundwater



50% percent of U.S. farmland recently suffered moderate to extreme drought, jeopardizing our food supply


 Learn more at water.epa.gov

Your logo here

Web PSAs – Utility or City/County Website



Print PSAs – Newspaper/Magazine

WATER WHAT IS IT WORTH TO YOU?



Our aging water and wastewater systems are at risk.

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Severe weather and aging pipes threaten our water services.

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Water Utility Public Awareness Kit



NUSHAT THOMAS

Active & Effective Team Leader

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epa.gov/communitywaterresilience

WSD's *What's Going On?* Newsletter

WSD-outreach@epa.gov



<http://www.epa.gov/waterresilience>

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“In God We Trust, All Others Must Bring Data” - A Distribution Utility’s Perspective

Magnus Borg

Chief Information Officer

NiSource Inc.

February 16, 2016



Chief Information Officer (CIO) Magnus Borg



Magnus Borg is chief information officer for NiSource, Inc.

Borg assumed this role following the separation of Columbia Pipeline Group from NiSource during 2015. He brings extensive background in IT Strategy, innovation, project execution and management having led IT departments initiatives for several national and international corporations.

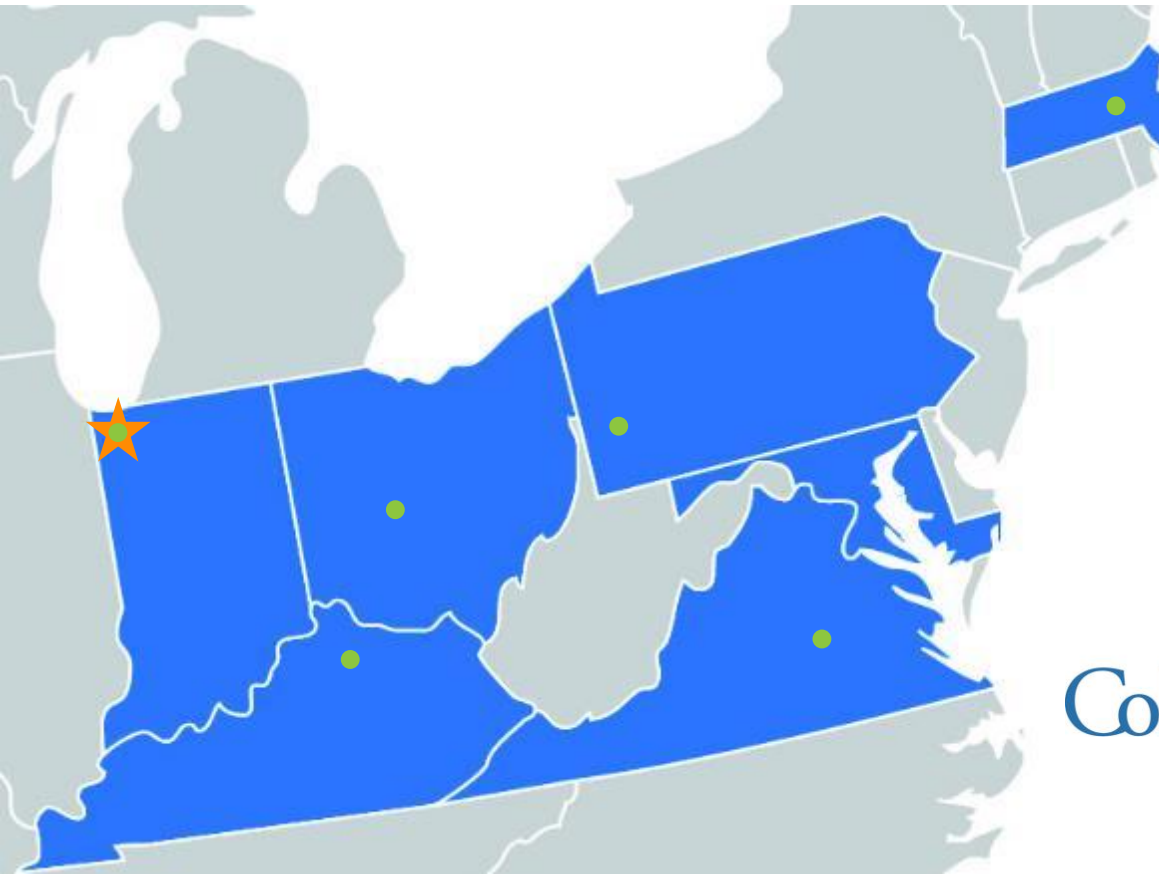
Prior to joining NiSource in July 2015, Borg was a senior advisor at PricewaterhouseCoopers LLP (PWC) where he focused on IT strategy, technology roadmaps and governance for various industries, including utilities. He has also held various leadership roles with Sigma-Aldrich Inc. (CIO); Safety-Kleen Inc. (CIO); Ericsson Inc. (senior vice president of new sales and CIO for North and South America); and Scandinaviska Enskilda Banken (General Manager), a global bank with headquarters in Sweden.

Borg is recognized for his knowledge in the areas of analysis, evaluation and negotiation. During his time in the IT industry (25+ years), Borg have managed IT strategy, organizational changes, new software/hardware platforms, Sarbanes-Oxley compliance, Security, vendor alignment and business process changes.

He has served as a member of the IT Advisory Board at Southern Methodist University in Dallas, Texas. He also served on the Verizon Advisory Board and Dell Advisory Board and chairman of CITA (International Motor Vehicle Inspection Committee) with consultancy status within the Economic and Social Council of the European Union.

Focused on Top-Tier Customer Satisfaction

An Industry-Leading Natural Gas and Electric Utility Company



- 7-State Footprint
- ~7,500 Employees
- ~3.5M Natural Gas Utility Customers
- ~500K Electric Utility Customers
- ~\$30B, 20+ Year Infrastructure Enhancement Plan
- Measure customer data in terabytes

Columbia Gas®

NIPSCO

One of the Nation's Largest Natural Gas Distribution Companies



Corporate Headquarters



State Utility Headquarters

Source

Cybersecurity Landscape

- **Types of Incidents for top 5 industries**

- Malicious code
- Sustained probe/scan
- Unauthorized access
- Suspicious activity
- Access or credential abuse
- Denial of service

Top 5 Industries	
1	Finance & Insurance
2	Information and Communication
3	Manufacturing
4	Retail & Wholesale
5	Energy & Utilities

- **Who are initiating the incidents?**

Outsiders – Organized crime, Nation states, Hacktivists

Malicious insiders – Employees with own motive

Unintended actors – Honest mistakes by employees

Unauthorized access incidents doubled from 2013 to 2014 accounting for 37% of the total Energy and Utilities edged out Health and Social Service for fifth place

Cybersecurity (examples)

Category	Key Activities
Strategy, Governance & Management	Identified roles and responsibilities Implemented Committees and Core Team Periodic read outs to a board
Security Training and Awareness	Purchased and distributed training modules Launched End User Awareness program Release of articles Periodic Phishing exercises and awareness assessments
Risk and Compliance	Alignment of a Framework (NIST etc.) Periodic IT Security Policy Updates
Incident and Crisis Management	Formalized incident & crisis management procedures File formal Cyber incident response plans Conducted annual table top and field exercises
Information & Privacy Protection	Process/procedure creation for data privacy & protection review Implementation of data loss prevention technology Update Contract to include Cybersecurity language
Identity & Access Management	Implemented multi-factor authentication solution for remote access Privileged Access Manager selection and implementation
Threat, Intelligence & Vulnerability Mgt	Internal and external penetration testing and possible remediated Selection of tool(s) for Access Control to block unauthorized devices Limit end user administrator rights to reduce spread of malware Implement internal penetration testing capability
Security Architecture and Services	Identified Security Event and Incident Management technology Physical security remediation at facilities Formalize application security standards

Cyber security as an holistic view

An Industry-Leading Natural Gas and Electric Utility Company

Balanced Strategic Priorities

- Enhance value to our customers and communities
- Build, maintain and operate a safe, reliable and efficient system
- Aligned, engaged employees, business partners and operations
- Financial discipline for our stakeholders



Delivering on Our Commitments

- Approximately \$1.4 billion in annual investments to systematically maintain reliability and further improve safety
- Elevating our customers' experience through new technology and system improvement
- Ongoing improvement of employee safety records and sustained solid employee engagement metrics
- Improving customer satisfaction ratings
- Sustainable earnings per share (non-GAAP) and dividend growth projected at 4-6% annually

2012 WORLD'S MOST
ETHICAL
COMPANIES
WWW.ETHISPHERE.COM

2013 WORLD'S MOST
ETHICAL
COMPANIES
WWW.ETHISPHERE.COM

MEMBER OF
Dow Jones
Sustainability Indices
In Collaboration with RobecoSAM

2014 WORLD'S MOST
ETHICAL
COMPANIES™
WWW.ETHISPHERE.COM

2015 WORLD'S MOST
ETHICAL
COMPANIES™
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