6th EWA / JSWA / WEF Joint Conference
„The Resilience of the Water Sector“
15-18 May 2018, Munich, Germany

# An All-Hazard Approach to Building Resilience

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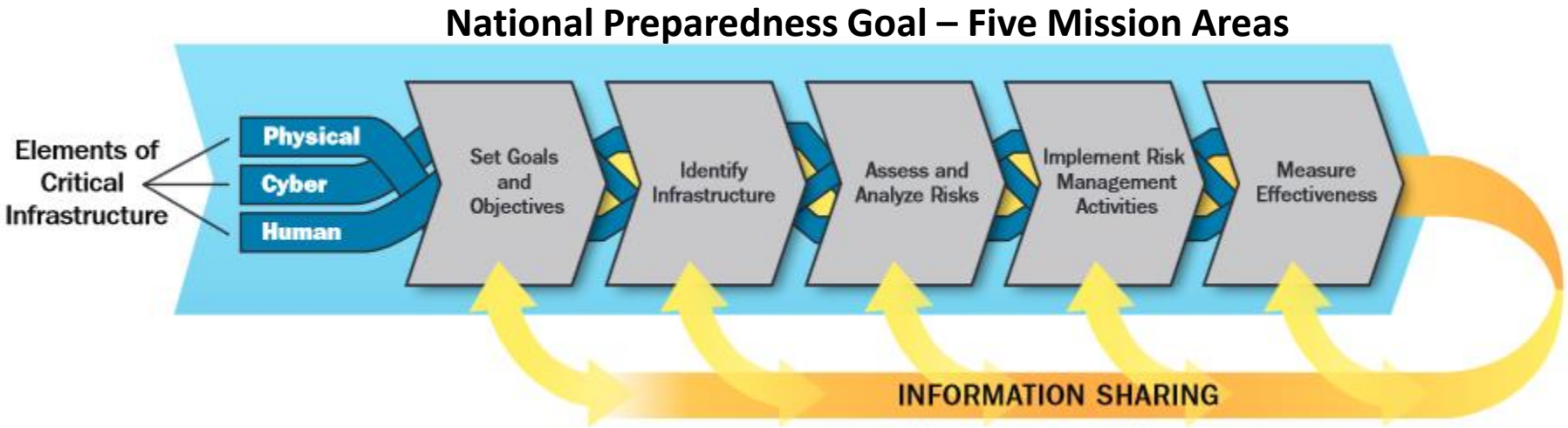
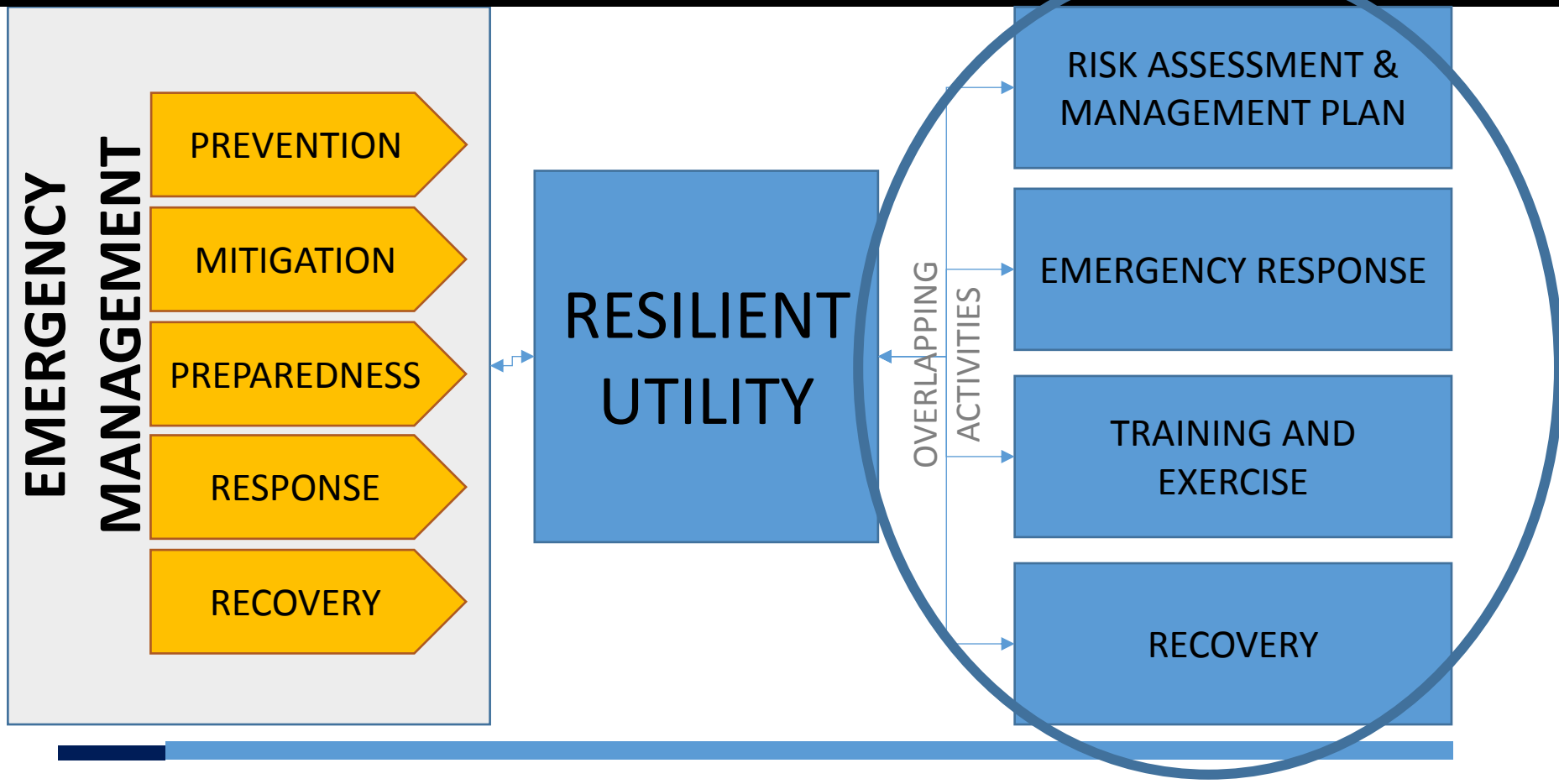
Wednesday, 16-MAY-2018

# What does an “All-Hazard” Approach Look Like for a Utility in U.S.?

1. Risk Analysis
2. Risk Management



# Water Sector Resilience and Emergency Management



# 32 “Core Capabilities” support 5 national preparedness mission areas

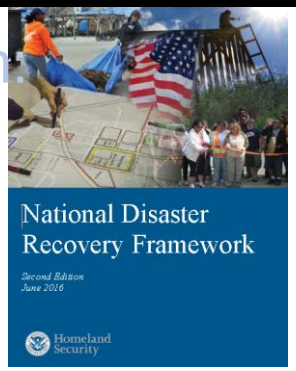
1. Planning
2. Public Information and Warning
3. Operational Coordination
4. Forensics and Attribution
5. Intelligence and Information Sharing
6. Interdiction and Disruption
7. Screening, Search, and Detection
8. Access Control and Identity Verification
9. Cybersecurity
10. Physical Protective Measures
11. Risk Management for Protection Programs and Activities
12. Supply Chain Integrity and Security
13. Community Resilience
14. Long-term Vulnerability Reduction
15. Risk and Disaster Resilience Assessment
16. Threats and Hazards Identification
17. Critical Transportation
18. Environmental Response/Health and Safety
19. Fatality Management Services
20. Fire Management and Suppression

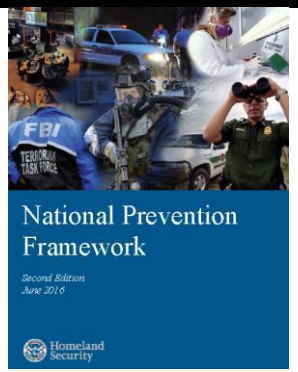

21. Infrastructure Systems
22. Logistics and Supply Chain Management
23. Mass Care Services
24. Mass Search and Rescue Operations
25. On-scene Security, Protection, and Law Enforcement
26. Operational Communications
27. Public Health, Healthcare, and Emergency Medical Services
28. Situational Assessment
29. Economic Recovery
30. Health and Social Services
31. Housing
32. Natural and Cultural Resources

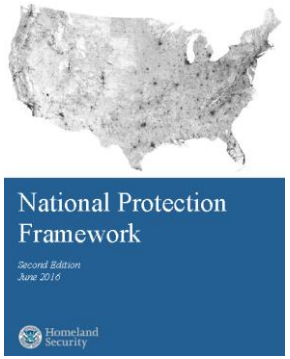
# Collaboration of Critical Infrastructure Community

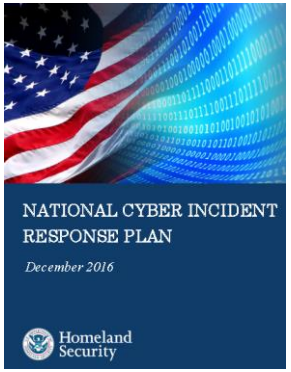
Collaboration structures established in:

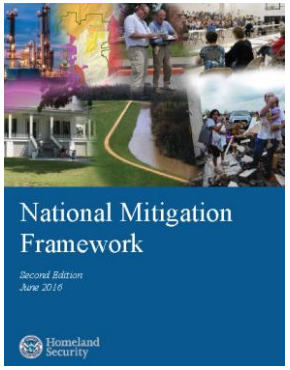
- National Prevention Framework
- National Protection Framework
- National Mitigation Framework
- National Response Framework
- National Disaster Recovery Framework
- National Cyber Incident Response Plan

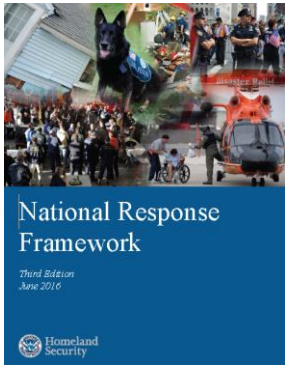


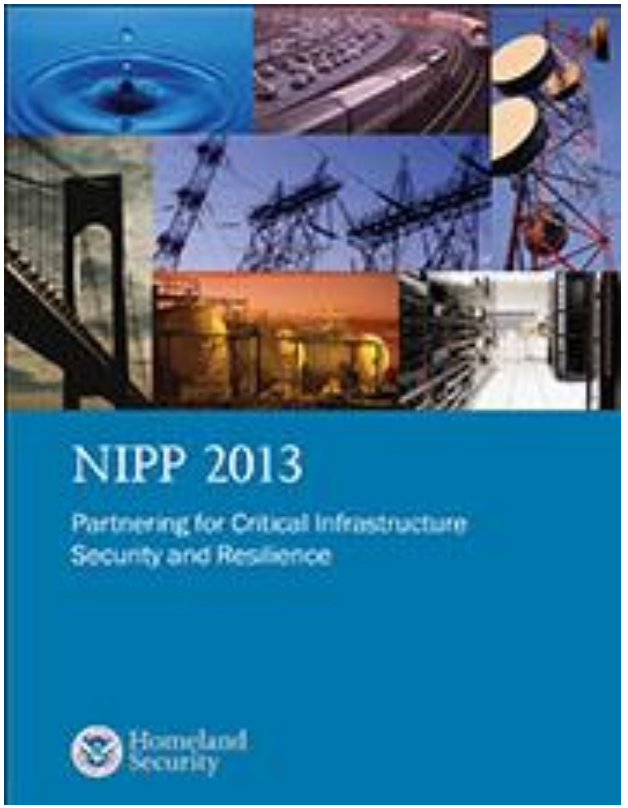



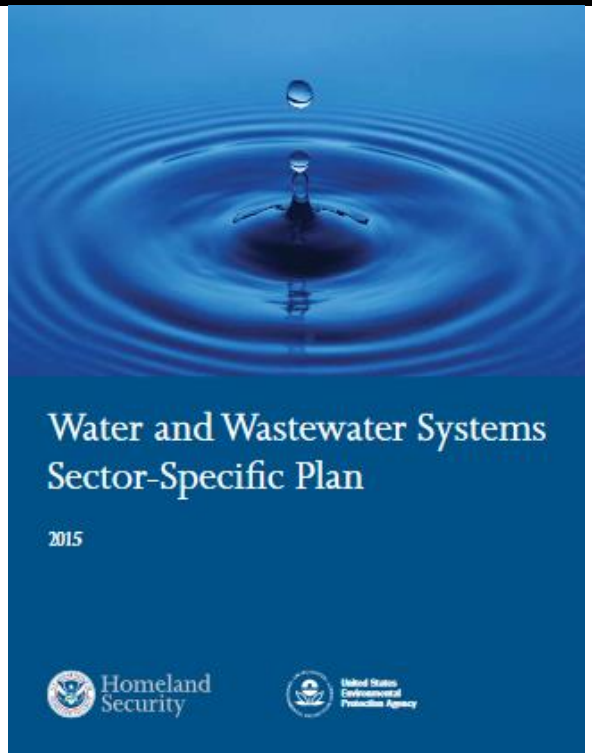
# National Infrastructure Protection Plan (NIPP)

- NIPP formalizes and strengthens existing critical infrastructure partnerships and creates baseline for how public and private sectors will work together



# Water and Wastewater Systems Sector-Specific Plan

- Partners collaborate to be better prepared to prevent, detect, respond to, and recover from all hazards

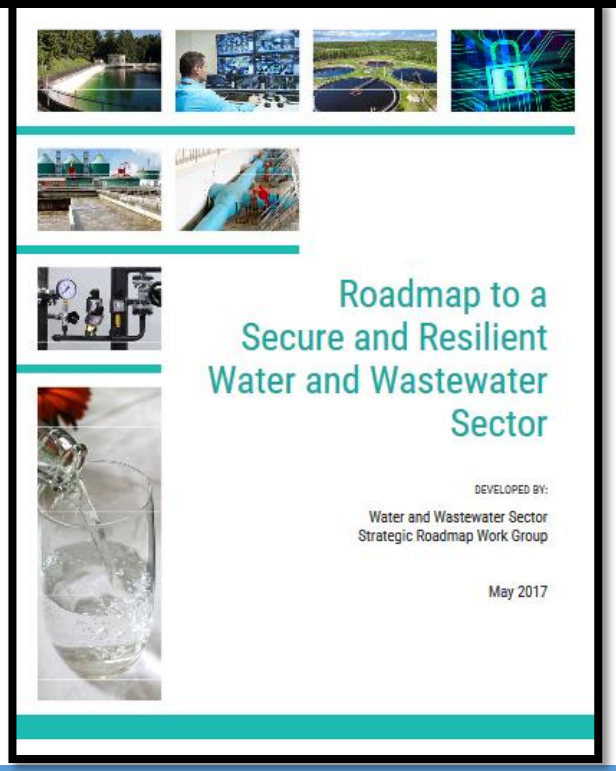


# Water and Wastewater Systems Sector- GOALS

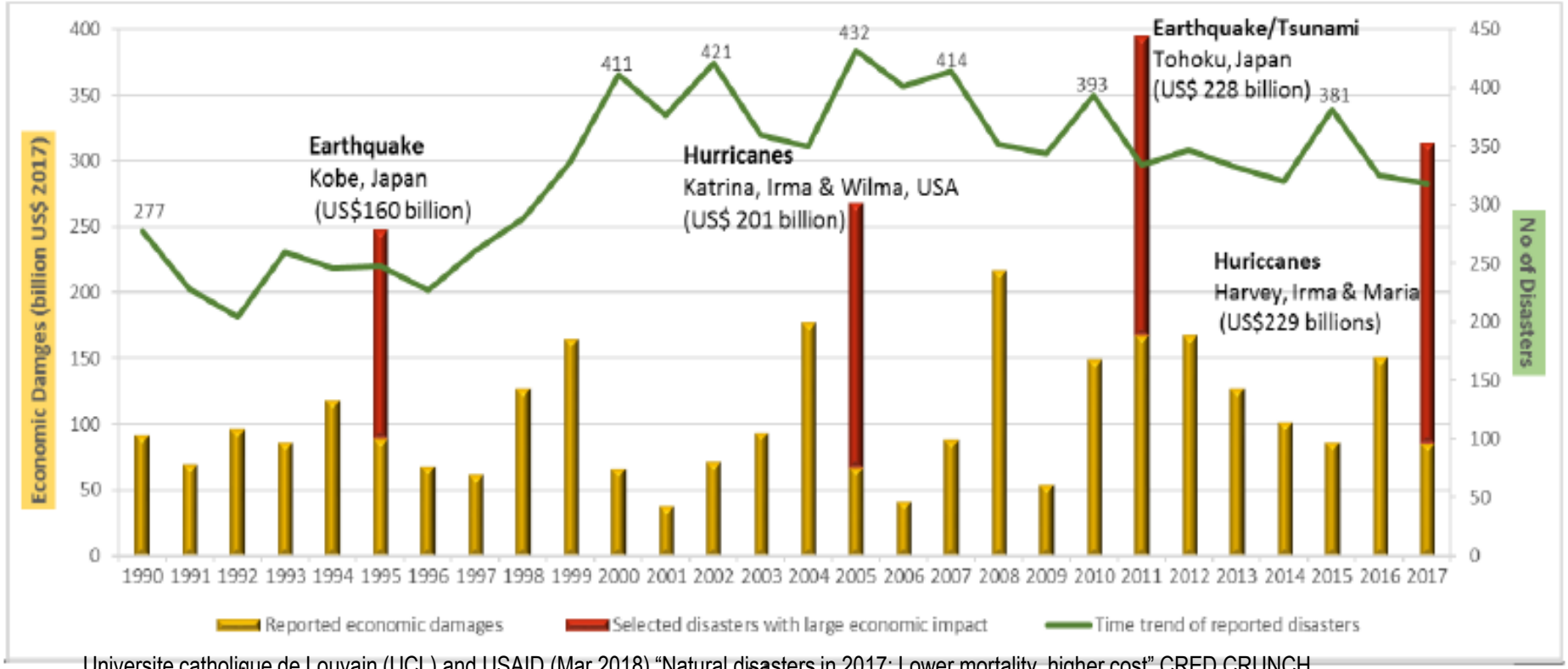
| | |
|---|---|
| GOAL 1 | Sustain protection of public health and the environment. |
| GOAL 2 | Recognize and reduce risk. |
| GOAL 3 | Maintain a resilient infrastructure. |
| GOAL 4 | Increase communication, outreach, and public confidence. |

# Water and Wastewater Systems Sector ROADMAP Priorities Highlighted

- Establish critical lifeline status of the Water and Wastewater Sector and translate that definition into strong support for the sector’s needs and capabilities.
- Improve detection, response, and recovery to contamination incidents.
- Advance preparedness and improve capabilities of the Water and Wastewater Sector for area-wide loss of water and power.
- Advance recognition of vulnerabilities and needed responses related to cyber risk management.



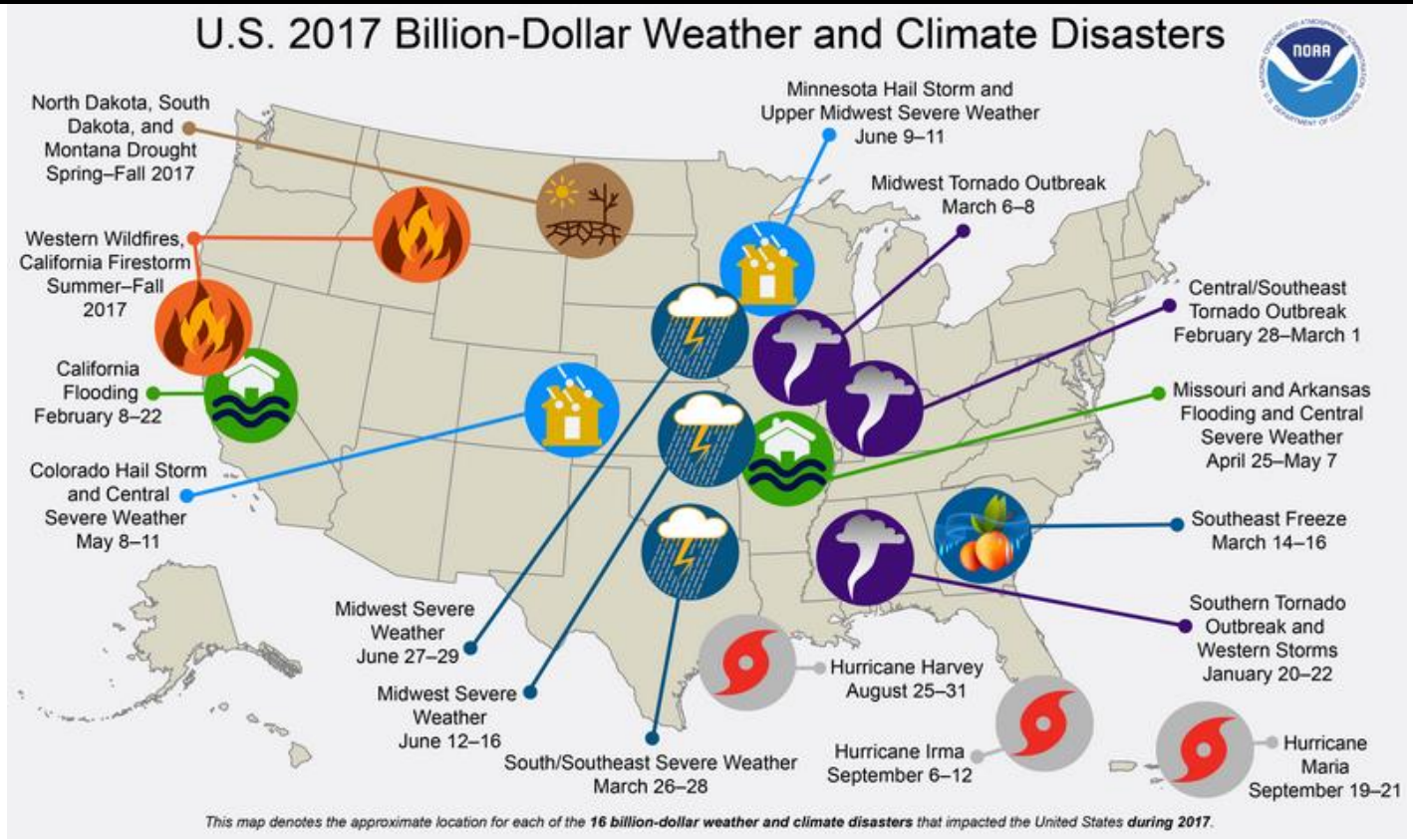
# 1990-2017 Economic Damages



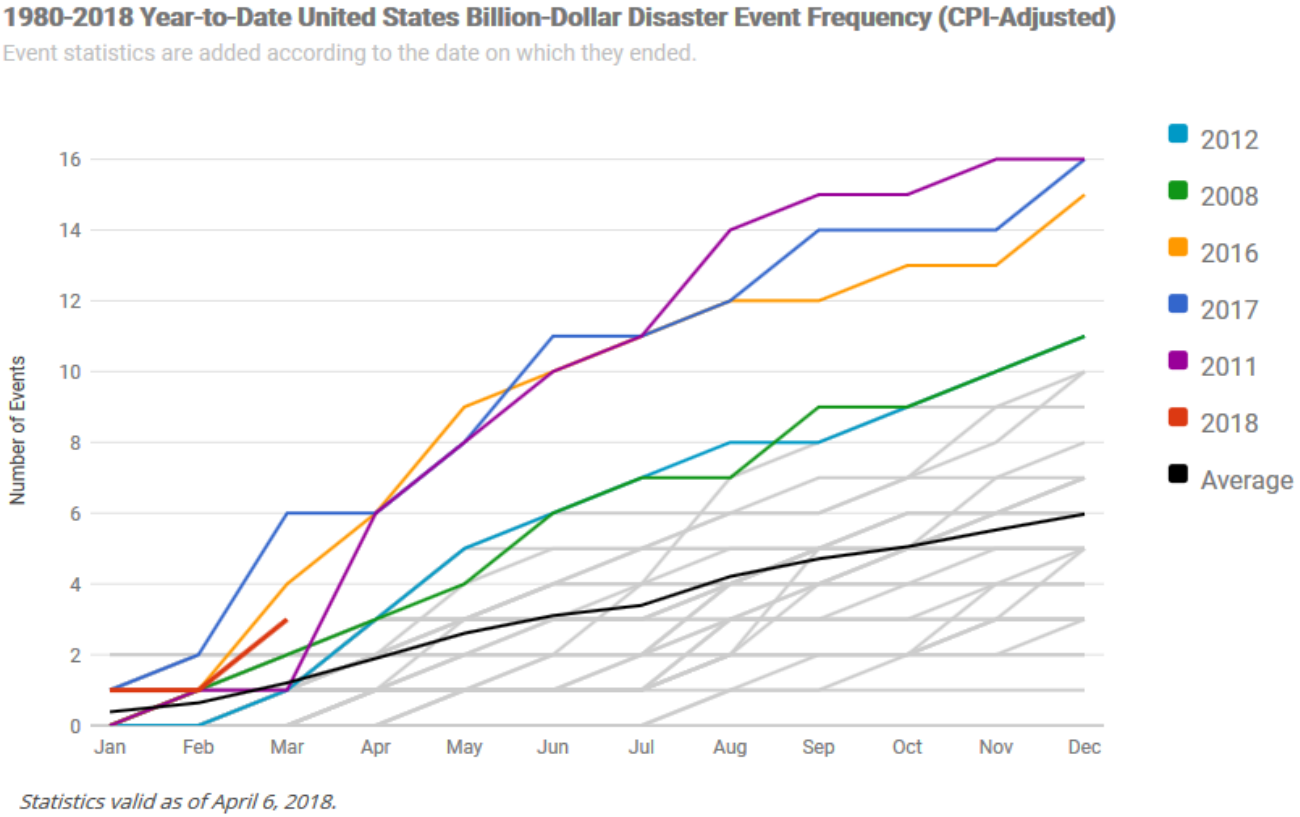

Universite catholique de Louvain (UCL) and USAID (Mar 2018) “Natural disasters in 2017: Lower mortality, higher cost” CRED CRUNCH, Web. http://cred.be/sites/default/files/CredCrunch50.pdf

EM-DAT: The Emergency Events Database - Université catholique de Louvain (UCL) - CRED, D. Guha-Sapir - www.emdat.be, Brussels, Belgium.

# NOAA 2017 Billion-Dollar Weather and Climate Disasters

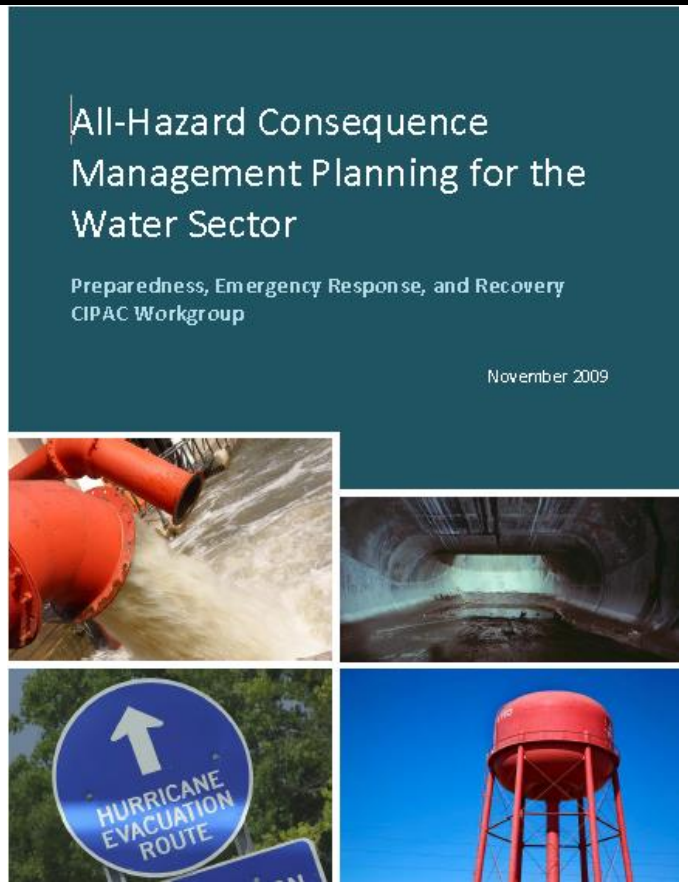


# NOAA 1980-2018 Billion-Dollar Disaster Event Frequency



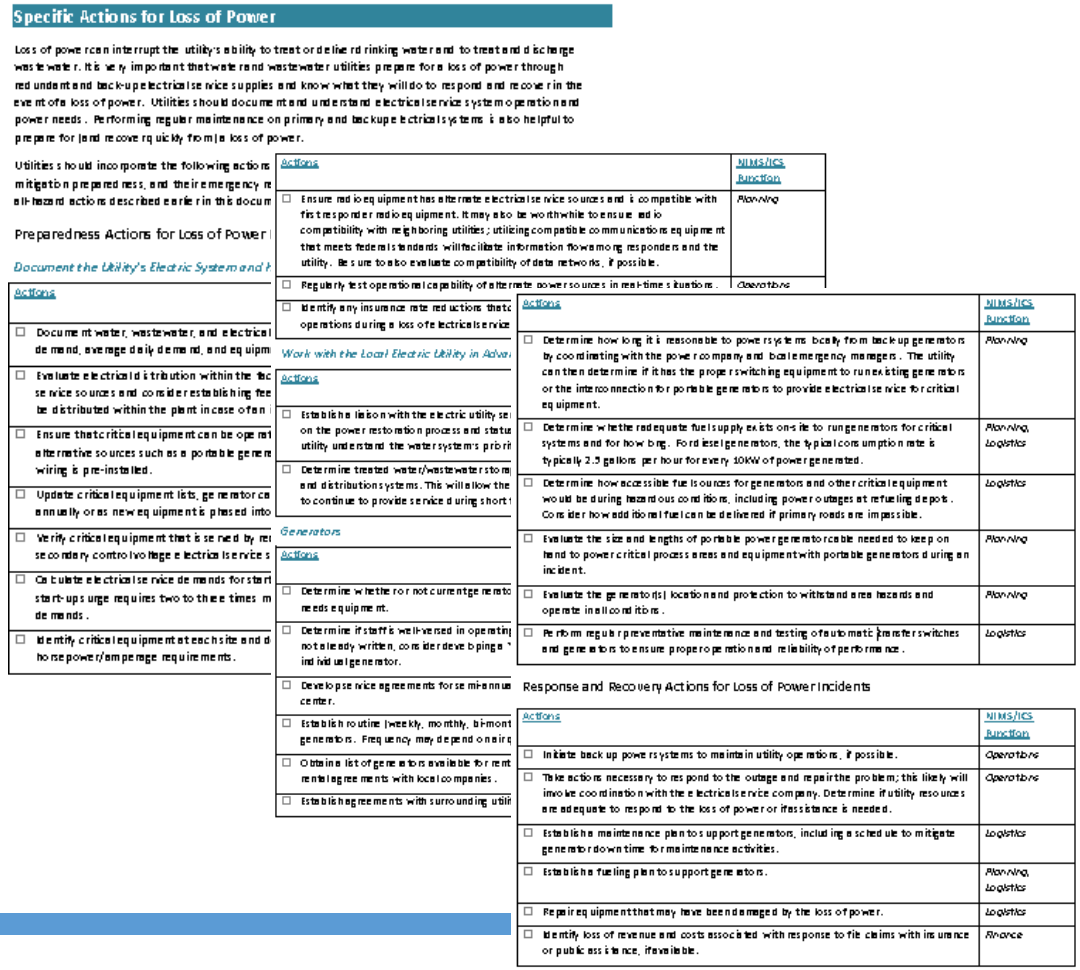
# All-Hazard Consequence Management TOOLS

Provides utilities with planning recommendations derived from emergency management, mitigation planning, and emergency response resources



# Specific types of incident checklists include:

- Loss of power
- Communications loss
- SCADA loss
- Service disruption
- Reduced workforce (e.g., because of pandemic flu or other disruption)
- Contamination incidents
- Economic disruption



**Specific Actions for Loss of Power**

Loss of power can interrupt the utility's ability to treat or deliver drinking water and to treat and discharge wastewater. It is very important that water and wastewater utilities prepare for a loss of power through redundant and back-up electrical service supplies and know what they will do to respond and recover in the event of a loss of power. Utilities should document and understand electrical service system operation and power needs. Performing regular maintenance on primary and backup electrical systems is also helpful to prepare for and recover quickly from a loss of power.

Utilities should incorporate the following actions
mitigation preparedness, and their emergency re
all-hazard actions described earlier in this docum

Preparedness Actions for Loss of Power

*Document the Utility's Electric System and*

| Actions |
|---|
| ☐ Docume nt water, wastewater, and electrical de mand, average daily de mand, and equipm |
| ☐ Evaluate electrical d istribution within the fac se rvice sources and consider establishing fee be distributed within the plant in case of an |
| ☐ Ensure that critical equipment can be operat alternative sources such as a portable genera wiring is pre-installed. |
| ☐ Update critical equipment lists, ge nerator ca annually or as new equipment is phased into |
| ☐ Verify critical equipment that is se rved by re se condary control voltage e lectrical se rvice s |
| ☐ Ca lculate electrical se rvice de mands for start start-ups urge requires two to three times m de mands. |
| ☐ Identify critical equipment at each site and d horse power/amperage requirements. |

| Actions | NIMS/ICS Function |
|---|---|
| ☐ Ensure radio equipment has alternate electrical se rvice sources and is compatible with first responder radio equipment. It may also be worthwhile to ensure radio compatibility with neighboring utilities; utilizing compatible communications equipment that meets federal standards will facilitate information flow among responders and the utility. Be sure to also evaluate compatibility of data networks, if possible. | *Planning* |
| ☐ Regularly test operational capability of alternate power sources in real-time situations. | *Operations* |
| ☐ Identify any insurance rate reductions that c operations during a loss of electrical service | |

*Work with the Local Electric Utility in Advan*

| Actions |
|---|
| ☐ Establish a liaison with the electric utility se on the power restoration process and status utility understand the water system's priori |
| ☐ Determine treated water/wastewater storag and distribution systems. This will allow the to continue to provide service during short |

*Generators*

| Actions |
|---|
| ☐ Determine whether or not current ge nerato needs equipment. |
| ☐ Determine if staff is well-versed in operating not already written, consider developing " individual generator. |
| ☐ Develop se rvice agreements for se mi-annua center. |
| ☐ Establish routine (weekly, monthly, bi-mont generators. Frequency may depend on air |
| ☐ Obtain a list of generators available for rent rental agreements with local companies. |
| ☐ Establish agreements with surrounding utili |

| Actions | NIMS/ICS Function |
|---|---|
| ☐ Determine how long it is reasonable to power systems locally from back-up generators by coordinating with the power company and local emergency managers. The utility can then determine if it has the proper switching equipment to run existing generators or the interconnection for portable generators to provide electrical service for critical equipment. | *Planning* |
| ☐ Determine whether adequate fuel supply exists on-site to run generators for critical systems and for how long. For diesel generators, the typical consumption rate is typically 2.5 gallons per hour for every 10KW of power generated. | *Planning, Logistics* |
| ☐ Determine how accessible fuel sources for generators and other critical equipment would be during hazardous conditions, including power outages at refueling depots. Consider how additional fuel can be delivered if primary roads are impassible. | *Logistics* |
| ☐ Evaluate the size and lengths of portable power generator cable needed to keep on hand to power critical process areas and equipment with portable generators during an incident. | *Planning* |
| ☐ Evaluate the generator(s) location and protection to withstand area hazards and operate in all conditions. | *Planning* |
| ☐ Perform regular preventative maintenance and testing of automatic transfer switches and generators to ensure proper operation and reliability of performance. | *Logistics* |

Response and Recovery Actions for Loss of Power Incidents

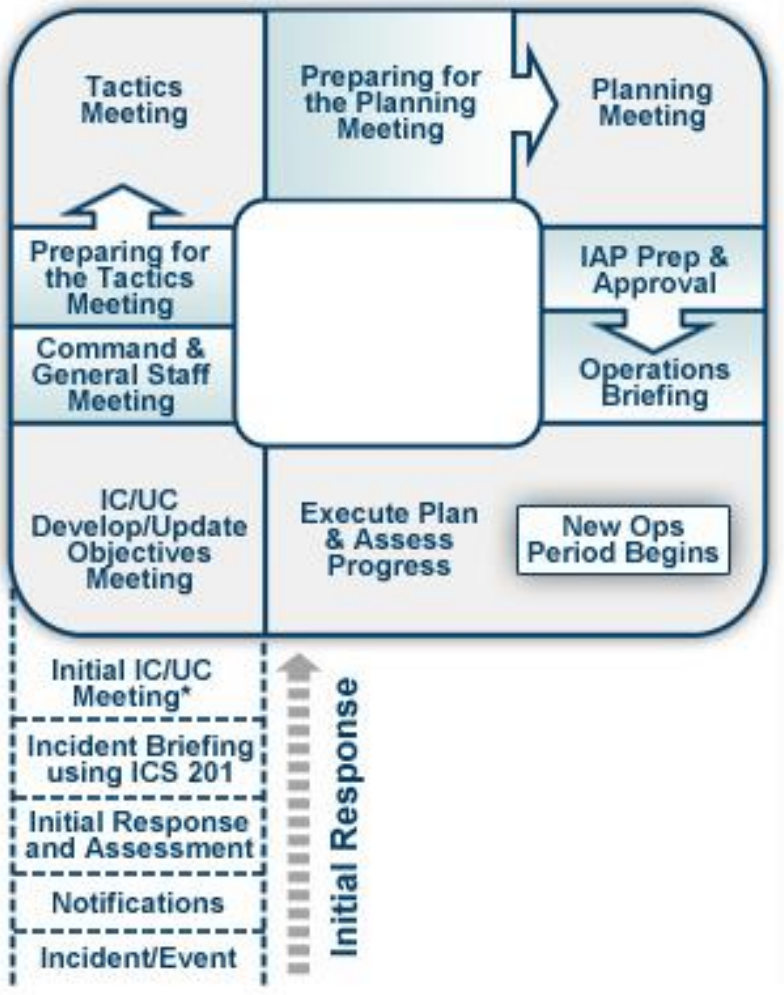
| Actions | NIMS/ICS Function |
|---|---|
| ☐ Initiate back up power systems to maintain utility operations, if possible. | *Operations* |
| ☐ Take actions necessary to respond to the outage and repair the problem; this likely will involve coordination with the electrical service company. Determine if utility resources are adequate to respond to the loss of power or if assistance is needed. | *Operations* |
| ☐ Establish a maintenance plan to support generators, including a schedule to mitigate generator down time for maintenance activities. | *Logistics* |
| ☐ Establish a fueling plan to support generators. | *Planning, Logistics* |
| ☐ Repair equipment that may have been damaged by the loss of power. | *Logistics* |
| ☐ Identify loss of revenue and costs associated with response to file claims with insurance or public assistance, if available. | *Finance* |

# All-Hazard Consequence Management TOOLS

## The Planning “P”

The five primary phases are:

- Analyze the Situation, Including Future Developments
- Establish Incident Objectives and Strategy
- Develop the Plan
- Prepare and Disseminate Plan
- Execute, Evaluate, and Revise Plan



# All-Hazard Consequence Management TOOLS

- Vulnerability Self Assessment Tool (VSAT)
  https://vsat.epa.gov/vsat/
  VSAT Web includes Water Health and Economic Analysis Tool (WHEAT) Calculator
- Climate Resilience Evaluation & Awareness Tool (CREAT)
  https://creat.epa.gov/creat/
- ANSI ASME-ITI AWWA J100 Standard
- Industrial Control Systems Cyber Emergency Response Team (ICS-CERT)
  https://ics-cert.us-cert.gov

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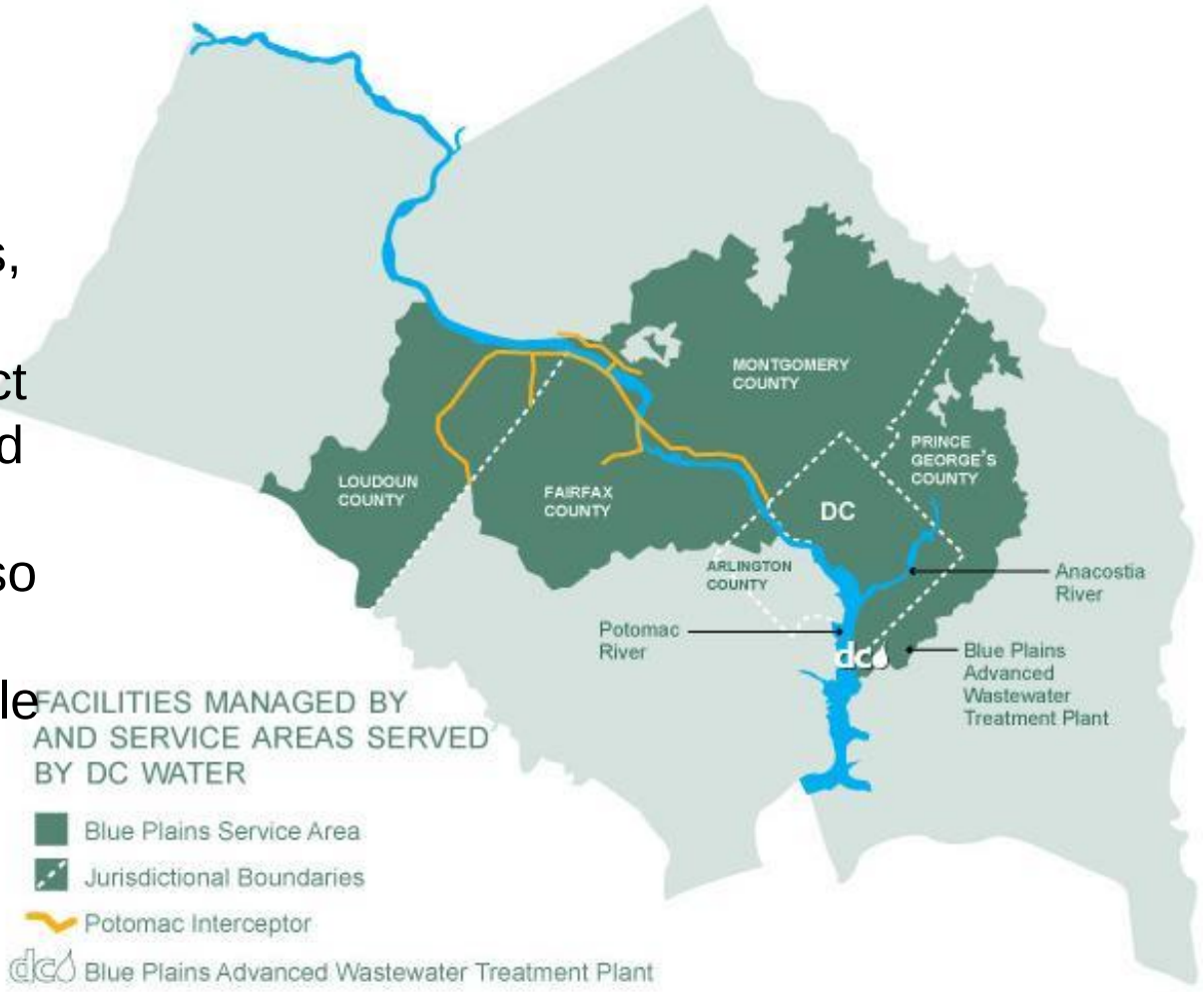
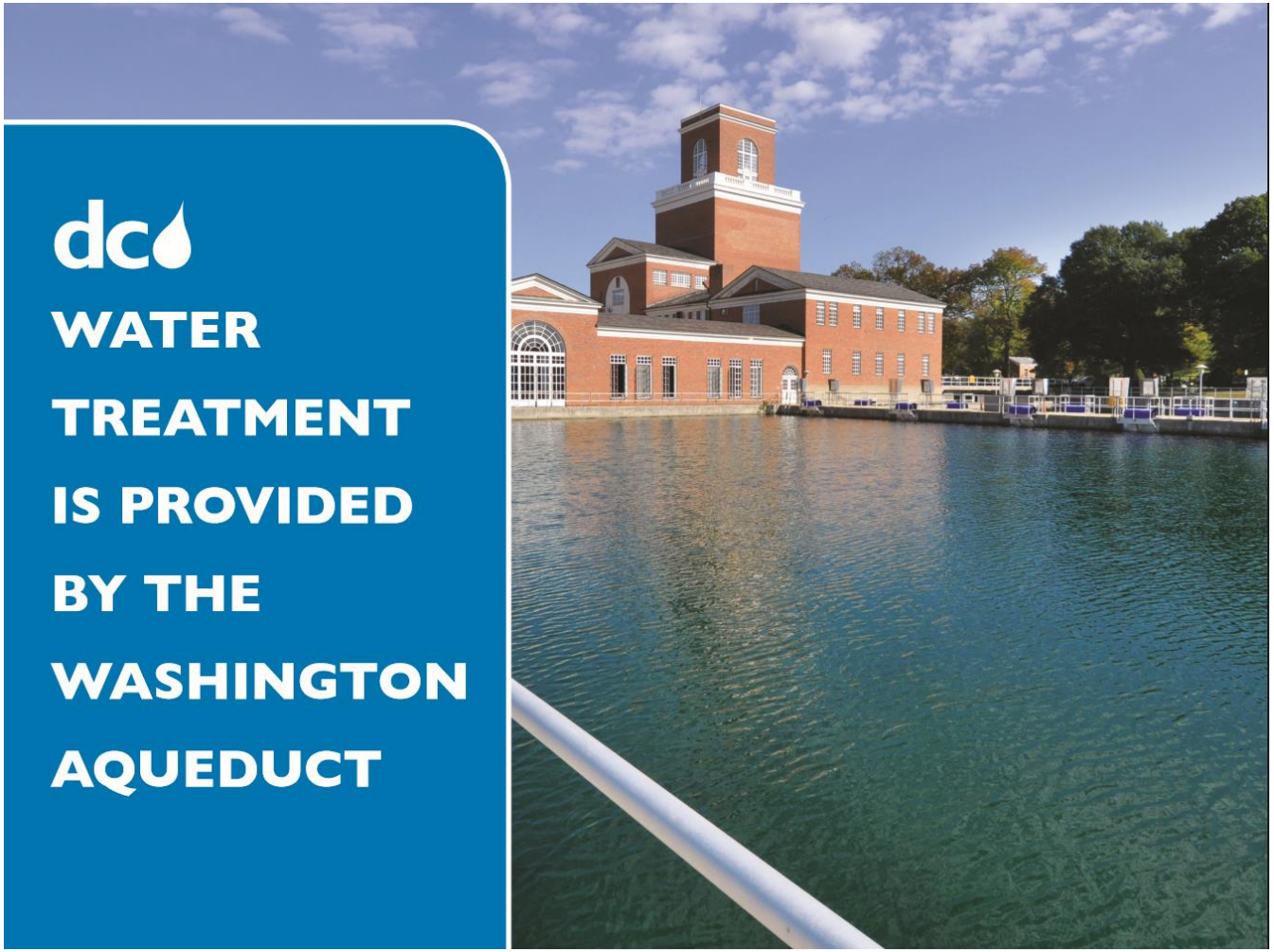
# Background and Existing Conditions

Critical Infrastructure and Resiliency

THE DC WATER EXPERIENCE

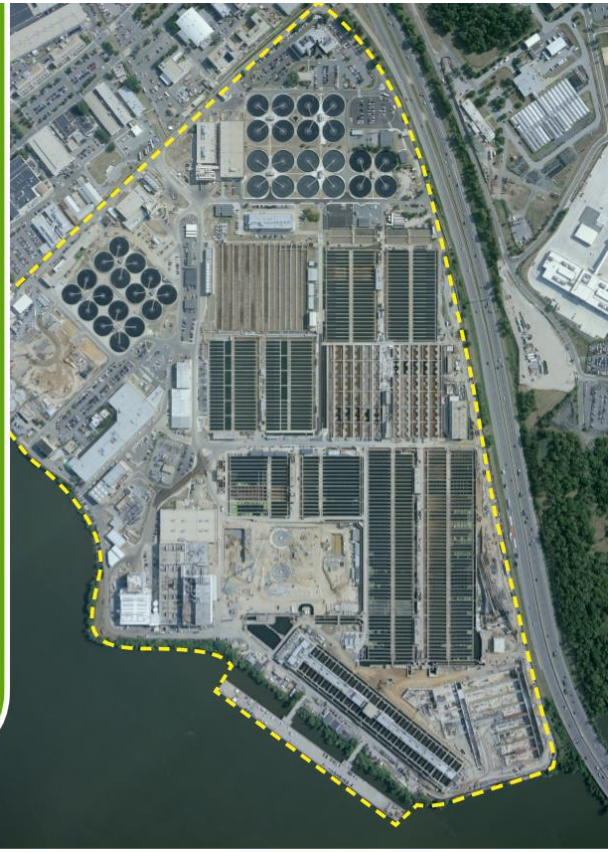
DC Water provides more than 600,000 residents, 17.8 million annual visitors, and 700,000 people who are employed in the District of Columbia with water and sewer/wastewater treatment services. We also treat wastewater from an additional 1.6 million people in Maryland and Virginia.




dc
WATER
TREATMENT
IS PROVIDED
BY THE
WASHINGTON
AQUEDUCT

dc

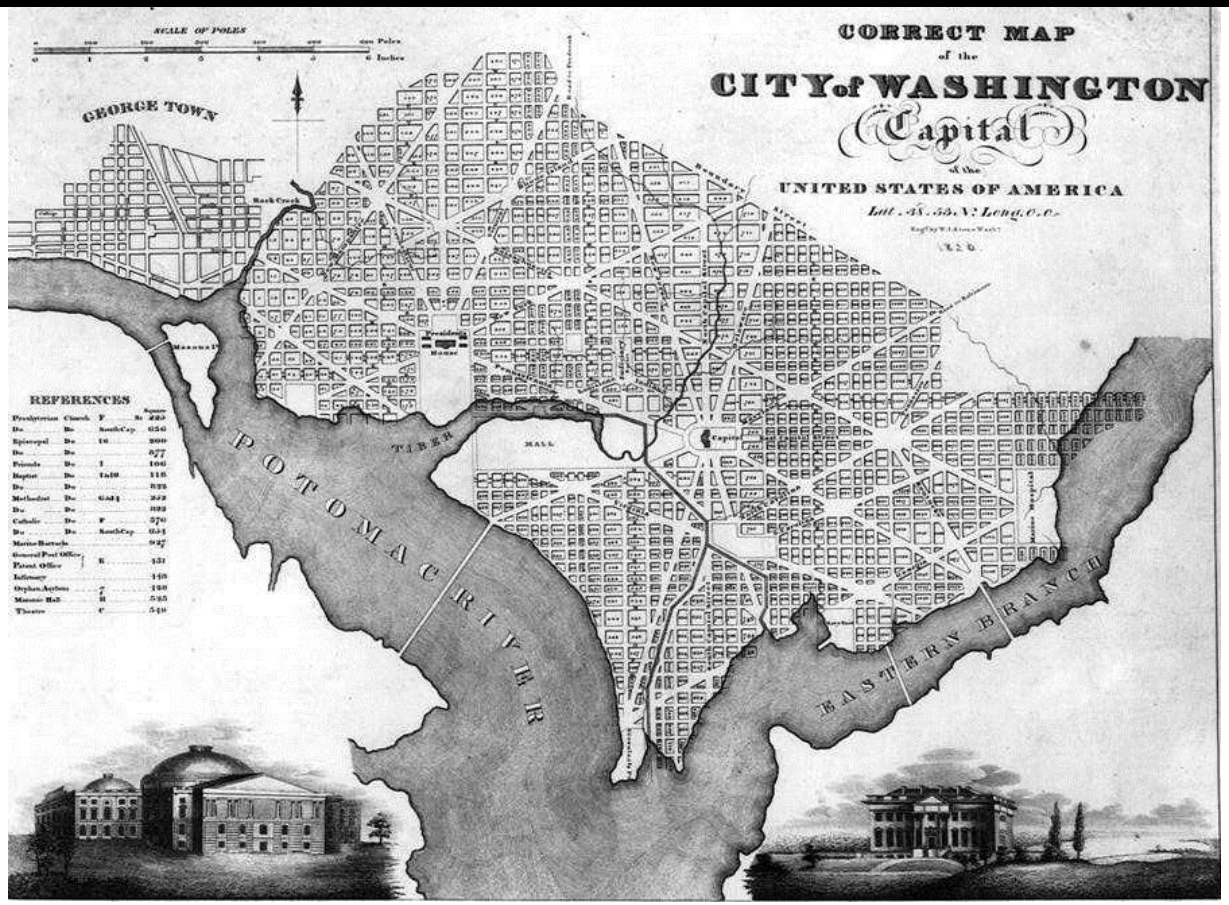
# BLUE PLAINS ADVANCED WASTEWATER TREATMENT PLANT



Treats an average of **300 million gallons** per day


1910
meter
reading
AGING INFRASTRUCTURE
MEDIAN AGE OF WATER MAINS IS 79 YEARS OLD
Half installed before 1936
Oldest date back to the Civil War

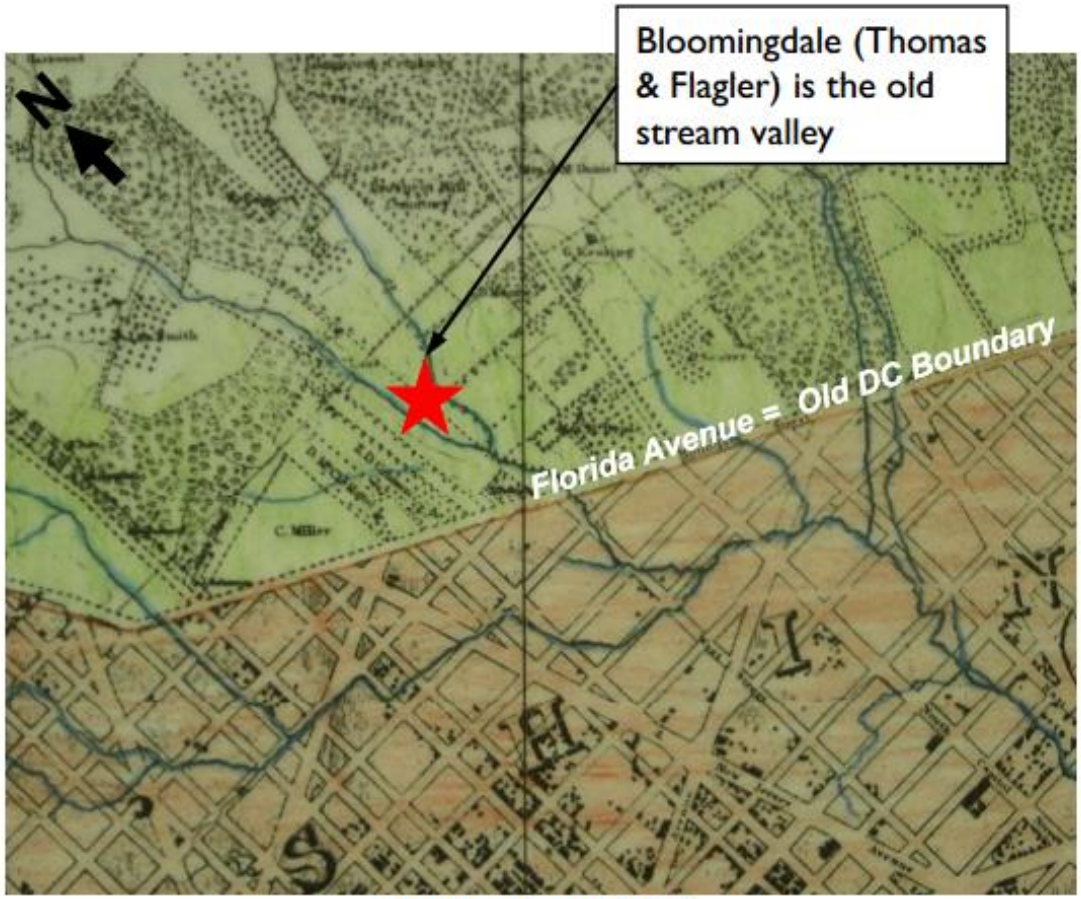
# DC Water’s core mission require us to be located and operational in areas vulnerable to flooding




- Historical development of sewer systems
- water flows dictated by topography and gravity

**WE CAN’T MOVE!**

# Water will go where it naturally wants to . . .




1860s Map of DC

**The Bloomingdale and LeDroit Park neighborhoods were developed at the turn of the last century when sewage systems were in their infancy.**

# DC Water is also facing

- Increased Wet Weather & Flooding Events
- Greater Temperature Swings (hot and cold)
- Severe Storms and Damaging Winds

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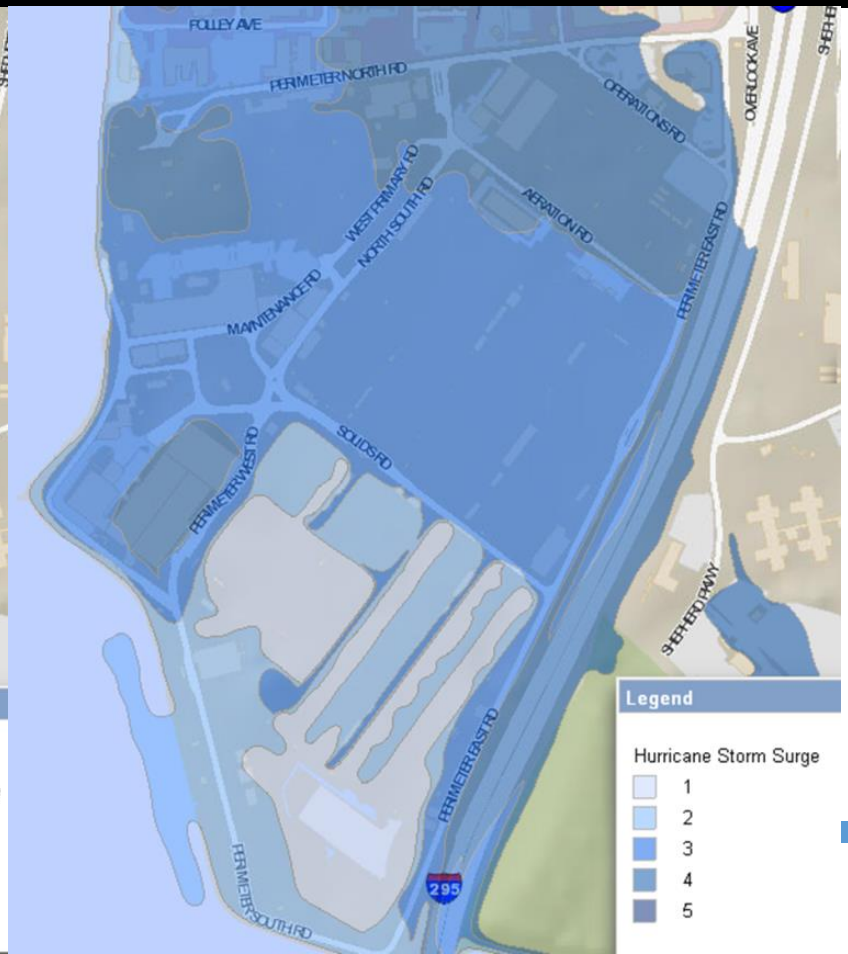
# Adaptation and Mitigation Activities

Critical Infrastructure and Resiliency

THE DC WATER EXPERIENCE

# Blue Plains Wastewater Treatment Plant

Flood protection strategy consists of constructing a seawall with top elevation of 17.2’ protecting against a 500-year flood elevation of 14.2’ with 3’ of freeboard.

# Blue Plains Flood Inundation

- Blue Plains considered a strategic asset
- With no sea-wall – 100-yr storm surge modelling shows that most of Blue Plains would be compromised

# DC Water is the largest electricity user in DC

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# Operational Preparedness and Resiliency

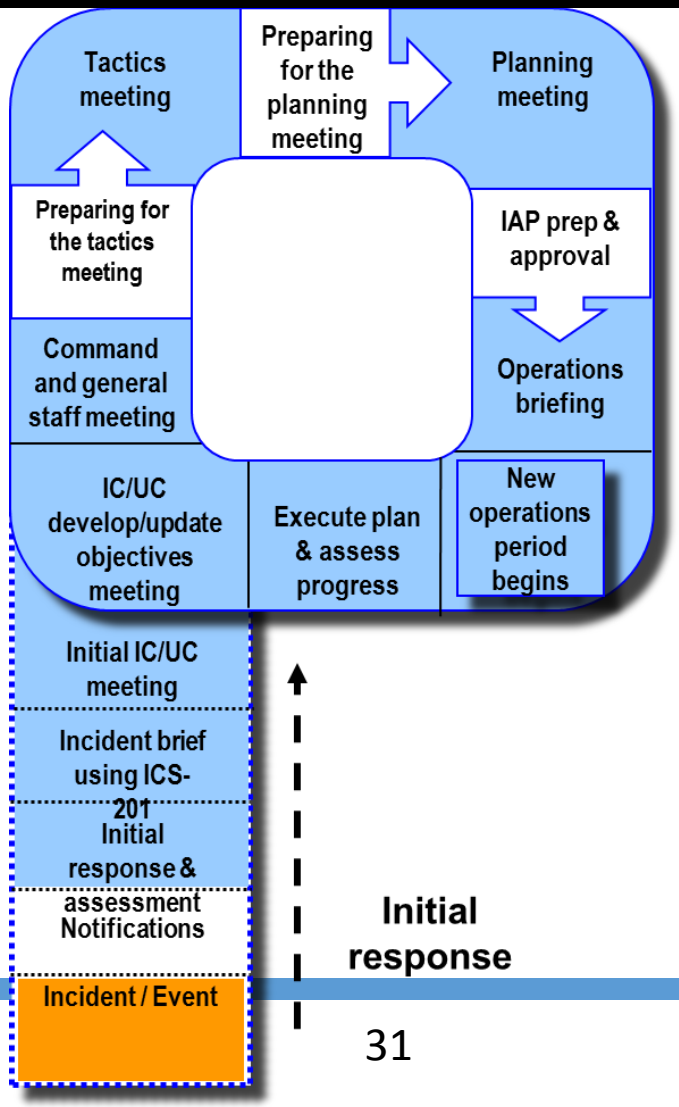
Critical Infrastructure and Resiliency

THE DC WATER EXPERIENCE

- DC Water Flood Response Plan being completed for all facilities and operations
- Specialized deployment plans for areas with critical facilities or known flooding challenges
- DC Water supports the update of the District Flood Response Plan and is a member of the DC Silver Jackets team
- Mandatory ICS training for all managers and supervisors (Including senior staff)

# Before an extreme weather event . . .

- Distributed all pre-planning and response documents to Managers and supervisors
- Started using and distributing Incident Command System documents
- Activated the DC Water Incident Management Team
- Commenced and ended response with the planning P



# Challenges and Lessons Learned . . .

- Need better flood and tide data
- Clarity of what would roles be during the response
- **Maintaining the rage…**
- Supporting Departments need to be included early in planning process
- Activating the IMT early helped during response
- Communicating up, down, in, and out
- Improved logistics and food support for our workers and support teams

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# Critical infrastructure – The big picture

Critical Infrastructure and Resiliency

THE DC WATER EXPERIENCE

# Managing Expectations in the Community
## multiple priorities and stakeholders – communication is key!