

Resilience & Technologies for Mitigating the Impact of Flooding - Panel Discussion

Smart Cities Council Webinar

Nashville Meeting



DHS SCIENCE AND TECHNOLOGY



**Homeland
Security**

Science and Technology

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Disaster Risks affect all of us and impacts every aspect of the Nation

No one agency owns resilience. It requires multi/inter-disciplinary solutions working across a diverse community of stakeholders.



Physical Resilience



Economic Resilience



Social Resilience

A Prepared and Resilient Nation

“We are still not prepared for everything. We can’t be. What we can do is instill a **“culture of resilience”** into our everyday lives. That culture is not just about bouncing back; it’s about bouncing forward, adapting even when you’re under attack, and coming back stronger to stare down the next challenge more decisively than before. “

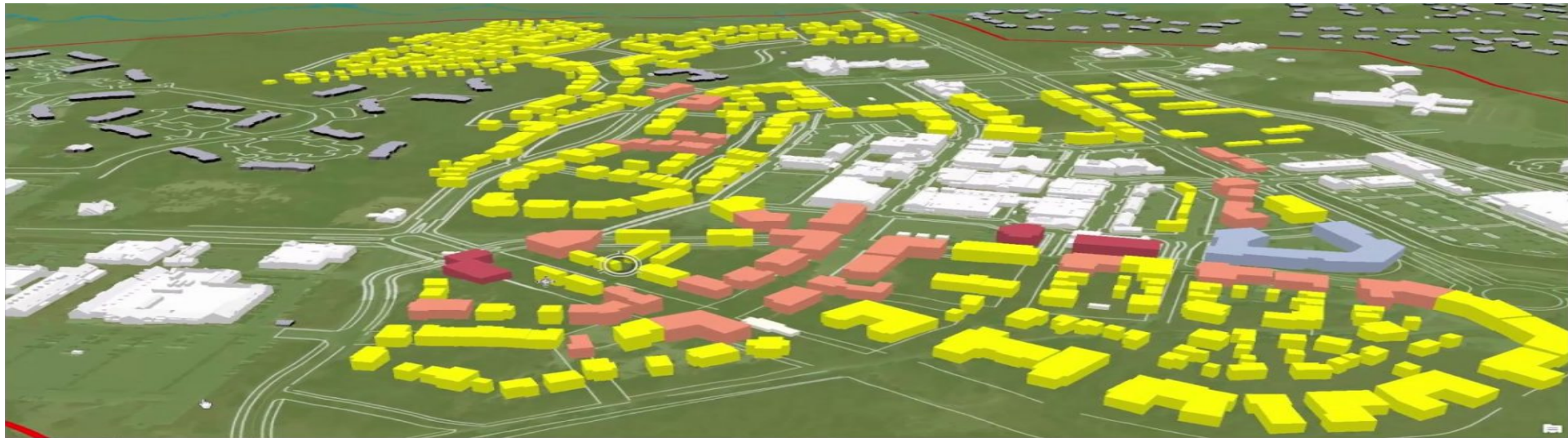
Secretary Kirstjen M. Nielsen, 2018

DHS FIVE MISSION AREAS



A Prepared and Resilient Nation: Where do we start?

In what topics areas can we channel industry and the Nation's R&D to provide immediate benefits, measurable results, and spur longer term innovation and positive outcomes?



DHS S&T R&D and Flood Risk Today

Floods are the
#1 Natural Disaster in the U.S.

- Flash Flooding Causes the Most Weather-Related Fatalities **200 Lives per year More than Tornadoes**
- About 9 Million People Live in Flood Hazard Areas, 50% are Uninsured or Under-Insured
- More than **500,000 Bridges** in the U.S. Cross Water. **9% are Structurally Deficient** and Subject to Increased Flood Damage
- Flood Damages Average **\$7.9 Billion Annually**, Rising Almost **2% per year**



On average, nearly 6,000 people are killed and over 445,000 people are injured in weather-related crashes each year. Approximately 22% annual crashes - nearly 1,259,000 - are weather-related. The vast majority of most weather-related crashes happen on wet pavement and during rainfall: 73% on wet pavement and 46% during rainfall.



New Flood Sensors & Alerting



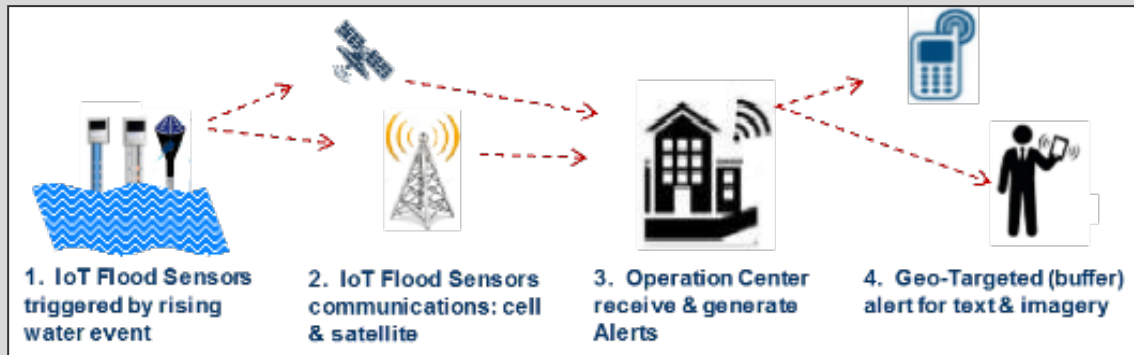
Traditional Stream Gage
\$25,000 + \$6,000 maintenance



Deployable Sensors
< \$1,000 +
\$0 annual maintenance

New sensors currently under test in the Flood Apex Program cost a few hundred dollars and can be deployed anywhere

Signals can be processed to produce flood alerts to send to smartphones in areas of immediate danger



Smarter Remote Sensing & Situational Awareness

Historical floods leave detectable changes in the landscape that can be picked up by satellites. Flood Apex is using LANDSAT imagery to detect areas **outside** of designated high risk flood areas that have experienced flooding in the past. This provides the means to make our flood hazard maps more accurate and emergency managers better prepared.



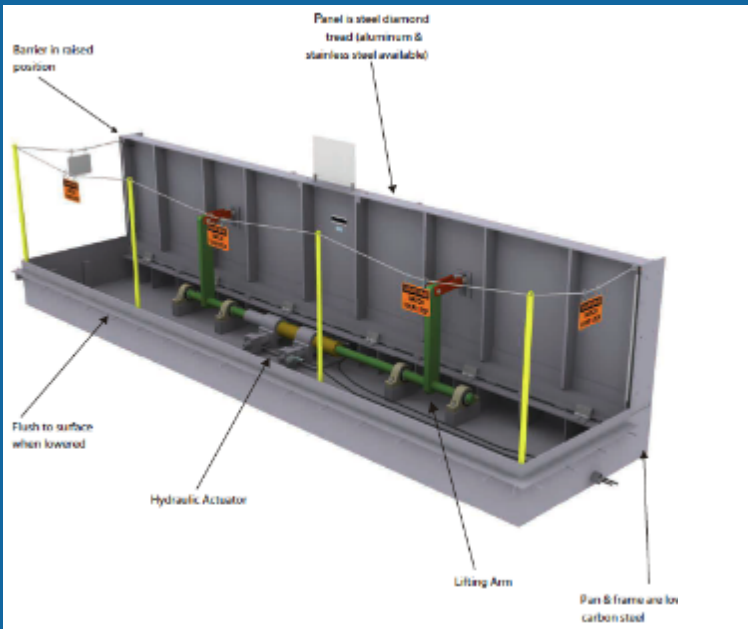
New Products from High Performance Computing

Artificial intelligence image processing running on supercomputers can reliably identify structures from aerial and satellite photographs.

Flood Apex is linking building and infrastructure footprints with flood risk maps and forecasts to produce new products and services for the flood insurance markets and gives property owners individualized information about their vulnerability to floods.



Realigned Economic Incentives & Risk Analysis



Flood Apex is investigating new ways to incentivize the private sector and individuals to take a more vital role in flood management and reducing risk



PRESRAY

One strategy is to develop national standards for flood proofing products, such as waterproofing materials and semi-permeable barriers

Flood proofing Standards / Testing & Certification

- A Research collaboration between
- Public-private partnership exemplar
- Goals to enhance/expand ANSI 2510 standards to include new market innovations
- Incorporate standards into the National Testing and Certification program
- Promote awareness, adoption, and inclusion of standards into FEMA Guidance and Bulletins



American National Standards Institute & ANSI 2510: National Standard for Flood Mitigation Equipment

- ANSI is an accredited standards development organization, using a consensus process
- The 2510 standard is intended to be used to evaluate the components and performance of flood abatement equipment
- Based on FM Approvals 2510 standard. Updated September 2020
- Is the **REQUIRED** standard for the NFBTCP



ANSI 2510 Categories and Test Elements

This standard sets performance requirements for flood mitigation equipment in the following product categories:

- Flood Barriers for Opening Barrier Applications
- **Flood Barriers for Perimeter Barrier Applications**
- Flood Mitigation Valves
- Flood Mitigation Pumps
- **Penetration Sealing Devices**

- **Hydrostatic and Tensile Strength**
- **System Leakage**
- **Component Durability – Cycling**
- **Vibration Resistance**
- **Impact and Wear Resistance**
- **Salt Spray Corrosion – Residue Build-Up**
- **Ultimate Elongation**
- **Compression Set**
- **Accelerated Aging**
- **Ultraviolet Light Exposure**
- **Air Oven Aging**
- **Biological Degradation Resistance**
- **Environmental Corrosion Resistance**
- **Extreme Temperature Operation**
- **Reliability Study**
- **Abrasion Resistance**
- **Hail Resistance**
- **Tear and Puncture Resistance**
- **Performance (Water Tests)**

National Flood Barrier Testing & Certification Program

Product Types

The Program currently tests/certifies:

- Perimeter barriers
- Opening barriers
- Flood Mitigation Valves
- Flood Mitigation Pumps
- Penetration Sealing Devices
- Flood Glazing

Partnership

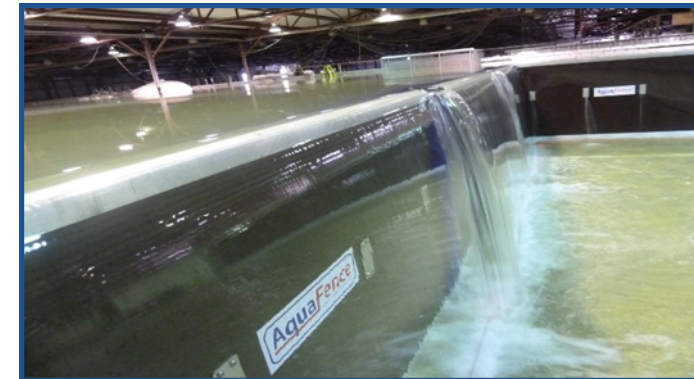
- *ASFPM*. Program administrator, maintains website
- *FM Approvals*. Certifies the product, confers the FM Diamond, conducts materials testing, facility audits
- *US Army Corps of Engineers*. Conducts water testing at ERDC lab



Closure Device (Opening Barrier)



Perimeter Barrier



Overtopping test at ERDC. Water is brought to 1 inch above the barrier and allowed to overflow.

ANSI 2510 & National Flood Barrier Testing & Certification Program

- Challenge: Failure of products during flood fighting; what is the right barrier product?
- Opportunity: Lots of solutions that go beyond sandbags and older technologies
- Benefits: Ability to tailor mitigation action to site and situation, products that work as advertised!



A temporary flood barrier at Burlington, Iowa, along the swollen Mississippi River failed, sending floodwaters rushing into the city's downtown. Picture from Des Moines Register, June 1, 2019



New glass flood wall / window glazing system

National Flood Barrier Testing & Certification Program

- Certified products earn the FM Diamond, a globally recognized quality mark from FM Approvals
- The FM Diamond is like the Underwriters Laboratory certification for consumer electronics
- FM Diamond ensures product quality and consistency



Find products at nationalfloodbarrier.org

ANSI 2510 into Practice

- Under Public Assistance (PA), for buildings, electric power, roads, bridges, potable water supply, and wastewater, FEMA requires that Applicants incorporate specific codes, specifications, and standards in accordance with FEMA Recovery Interim Policy FP 104-009-11 Consensus-Based Codes, Specifications and Standards for Public Assistance.
- Will be included in upcoming update of FEMA Technical Bulletin 3: Requirements for the Design and Certification of Dry Floodproofed Non-Residential and Mixed-Use Buildings. TB-3 is guidance for implementation of community's floodplain management requirements.