FEMA

# Fact Sheet

**FEMA Dam Safety Series**
**Fact Sheet 1: Use of Emerging Technologies** **June 2018**

## BACKGROUND

Emerging technologies are being used to accelerate the real-time delivery of information for decision making on dam safety and emergency management, improve internal communications, provide more timely notifications to the public, and increase dam operational safety. Examples of the emerging technologies that were successfully used during Hurricane Matthew are:

- Remotely operated cameras
- Drones
- Geospatially linked mass notification systems
- Advanced communication technologies

### Purpose and Intended Audience

This Fact Sheet shares examples of the successful use of emerging technologies for the dam emergencies that occurred during Hurricane Matthew in 2016. This Fact Sheet also provides information on actions that can be taken to reduce risks, improve emergency response, and improve communication related to dams.

The intended target audience for this Fact Sheet includes federal, state, territory, and local officials; tribal leaders; county and city engineers, planners, and emergency managers; dam owners and operators; building and property owners near or potentially affected by a dam failure; and other interested stakeholders.

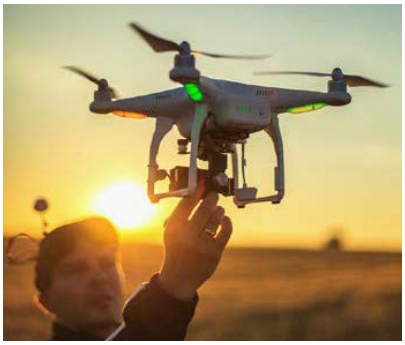
## REMOTELY OPERATED CAMERAS

Remotely operated cameras are unmanned stationary cameras that can send and receive data via a computer network or the Internet. Such cameras are typically installed at the dam site. Data from the cameras can be broadcast remotely without the need for on-site personnel. This capability is beneficial when it is too dangerous or impractical to have personnel at the dam. The real-time images can also be used to dispel rumors and misinformation about the condition of the dam during an evolving event.

### Examples of Actions Taken

During Hurricane Matthew, Moore County, NC, officials activated a remotely operated camera focused on Woodlake Dam and streamed it live on the County's website so all interested parties could see real-time conditions and activities at the dam. Officials from Bladen County, NC, which is downstream of Woodlake Dam, reported that the live stream was effective in facilitating communication about the dam and helped dispel incorrect information that was being reported by broadcast and social media in the County. The link to Moore County's live feed was also shared on North Carolina's State Preparedness and Resource Tracking Application (NC SPARTA) and the web-based emergency operations center (WebEOC) at the FEMA Regional Response Coordination Center (RRCC) to further facilitate communication and provide a common operating picture (COP).

## DRONES



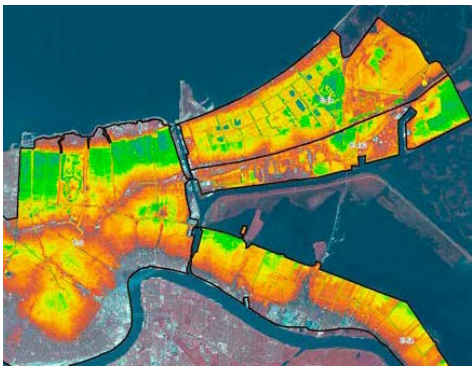
Drones, also known as Unmanned Aerial Systems (UAS), are unmanned aircraft guided by remote control or onboard computers. They use aerial imaging to monitor areas that would be difficult or unsafe to access, and may be faster to deploy than traditional piloted planes.

Drones are used to perform an initial visual assessment of the condition of a dam and related infrastructure. Drones can also be fitted with equipment to collect topographic data to detect changing conditions such as erosion or slope instability at or downstream of dams or within a dam breach inundation area.

### Examples of Actions Taken

During Hurricane Matthew, officials from Moore County, NC, used a drone equipped with a camera to collect information on the conditions at Woodlake Dam. The information collected by the drone was compared with historical orthophotographs to identify structural damage at the dam.

## GEOSPATIALLY LINKED MASS NOTIFICATION SYSTEMS



Recent innovations linking communications with geospatial data have enhanced the effectiveness of mass notification systems. These systems can facilitate efficient update of mass notification databases using geospatial data, such as dam inundation maps. In addition, a developing technology called geofencing can potentially be used to identify and notify members of the public who travel into or out of geographical areas. Geofencing uses global positioning system (GPS) and radio-frequency identification (RFID) technology to create responses when mobile devices pass through virtual geographical boundaries.

Refer to Fact Sheet 2 of this series for additional information on mass notification systems.

### Examples of Actions Taken

At the time Hurricane Mathew made landfall, the Wake County EOC used printed dam inundation zones to approximate areas for mass notification. Based on lessons learned from the event, Wake County loaded digital dam breach inundation zone geospatial maps into its new mass notification system the following March (2017). The use of digital dam breach maps improved accuracy and allowed rapid identification of areas for mass notification. In April 2017, Wake County experienced another threatened dam failure (Lewis Dam). Following this event, areas used for mass notification were expanded to include all areas within a land parcel, even if only a portion was in the inundation zone.

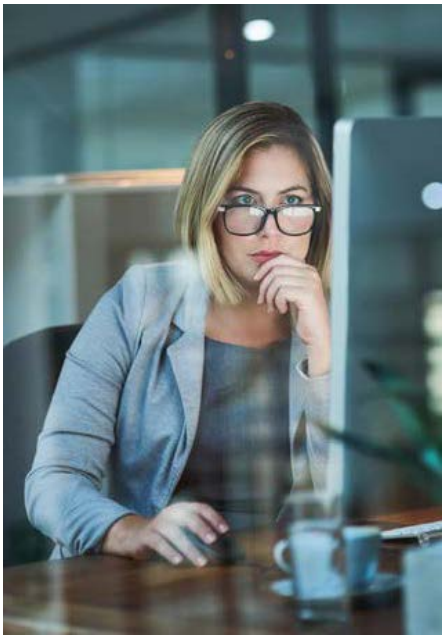
## ADVANCED COMMUNICATION TECHNOLOGIES

### Web-Based Information Management Systems

Web-based information management systems serve as collaborative and secure data repositories for real-time emergency or event-related information sharing. These systems are available commercially or can be developed internally. Access is provided to those with a need to use the system.

#### Examples of Actions Taken

Wake County, NC, used a web-based information management system to track dam conditions (alert status, pool height) at Lake Benson and Lake Wheeler, coordinate with the City of Raleigh (the dam owner/ operator), determine the status of protective actions, and document dam construction details and emergency action plans.



### North Carolina's State Preparedness and Resource Tracking Application

NC SPARTA is a web-based, password-protected application that provides a common operating picture (COP) for those who have access to it for emergency operations. A COP is a situational awareness application that supports collaborative planning and response using a shared data platform. North Carolina's Department of Public Safety provides NC SPARTA access to federal, state, county, and local emergency managers with a need to use the system.

#### Examples of Actions Taken

During Hurricane Matthew, FEMA and North Carolina's Department of Public Safety used NC SPARTA for disaster and emergency management operations to make data on dam incidents and failures and other information available to those who have access to the system, including the RRCC and others.

#### Social Media

The use of social media platforms, such as Twitter and Facebook, is evolving as a means for notifying the public about unfolding situations, for citizens to request information or alert officials about unfolding events or pertinent observations, and to help emergency managers develop situational awareness, from which they can develop a COP. Refer to Fact Sheet 2, *Notification Methods*, in this series for more detailed discussion of the use of social media in dam emergency response.

## REFERENCES AND RESOURCES

### Resources

ASTM C1661-13: *Standard Guide for Viewing Systems for Remotely Operated Facilities*. https://www.astm.org/Standards/C1661.htm

FEMA. 2017. *Hurricane Matthew in North Carolina Dam Risk Management Assessment Report*. FEMA P-1090. https://www.fema.gov/media-library/assets/documents/131866

FEMA. 2015. *FEMA Resources and Services Applicable to Dam Risk Management*. FEMA P-1068. https://www.fema.gov/ media-library-data/1452453732996-ecaca7db5837aba46a7bbece7bc2f17e/DamRiskManagementResources.pdf

FEMA. 2015. *Mitigation Dam Task Force Strategic White Paper on Dam Risk*. FEMA DR-SC-4241. https://www.fema.gov/ media-library-data/1450272827214-fb60879c33e180f3541a5cfb133e54b2/DR-SC-4241-FinalWhitePaper.pdf

FEMA. 2013. *Federal Guidelines for Dam Safety: Emergency Action Planning for Dams.* FEMA 64. https://www.fema.gov/ media-library-data/5b20db599c212f77fd5e85d256f471a3/EAP_Federal_Guidelines_FEMA_P-64.pdf

FEMA. 2013. *Federal Guidelines for Inundation Mapping of Flood Risks Associated with Dam Incidents and Failures.* FEMA P-964. https://www.fema.gov/media-library-data/96171edb98e3f51ff9684a8d1f034d97/Dam_Guidance_508.pdf

Myers, Barry, K. 2017. *Managing Dam Safety Risk with Performance Monitoring.* 2017 Oregon Dam Safety Conference. http://www.oregon.gov/owrd/docs/5o%20Barry%20Myers.pdf

U.S. Department of Homeland Security. 2013. *Innovative Uses of Social Media in Emergency Management.* https://www.dhs.gov/sites/default/files/publications/Social-Media-EM_0913-508_0.pdf

### Useful Websites

Federal Trade Commission, Consumer Information. Using IP Cameras Safely: https://www.consumer.ftc.gov/articles/0382-using-ip-cameras-safely

North Carolina Dam Safety Program: https://deq.nc.gov/about/divisions/energy-mineral-land-resources/energy-mineral-land-permits/dam-safety

North Carolina Department of Public Safety, Emergency Management: https://www.ncdps.gov/our-organization/emergency-management

North Carolina Department of Transportation, Operating Unmanned Aircraft Systems (UAS) in North Carolina: https://www.ncdot.gov/aviation/uas

South Carolina Dam Safety Program: http://www.scdhec.gov/Environment/WaterQuality/DamsReservoirs/DamsOverview

South Carolina Emergency Management Division: http://www.scemd.org

## Other Fact Sheets in this Dam Safety Series

Fact Sheet 2: Notification Methods

Fact Sheet 3: Benefits of Pre-Event Exercises and Training

Fact Sheet 4: Proactive Actions

Fact Sheet 5: Benefits of Post-Event Data Collection for Dams

**The National Dam Safety Program** is a partnership of the states, federal agencies, and other stakeholders that encourages and promotes the establishment and maintenance of effective federal and state dam safety programs to reduce the risks to human life, property, and the environment from dam-related hazards.

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