

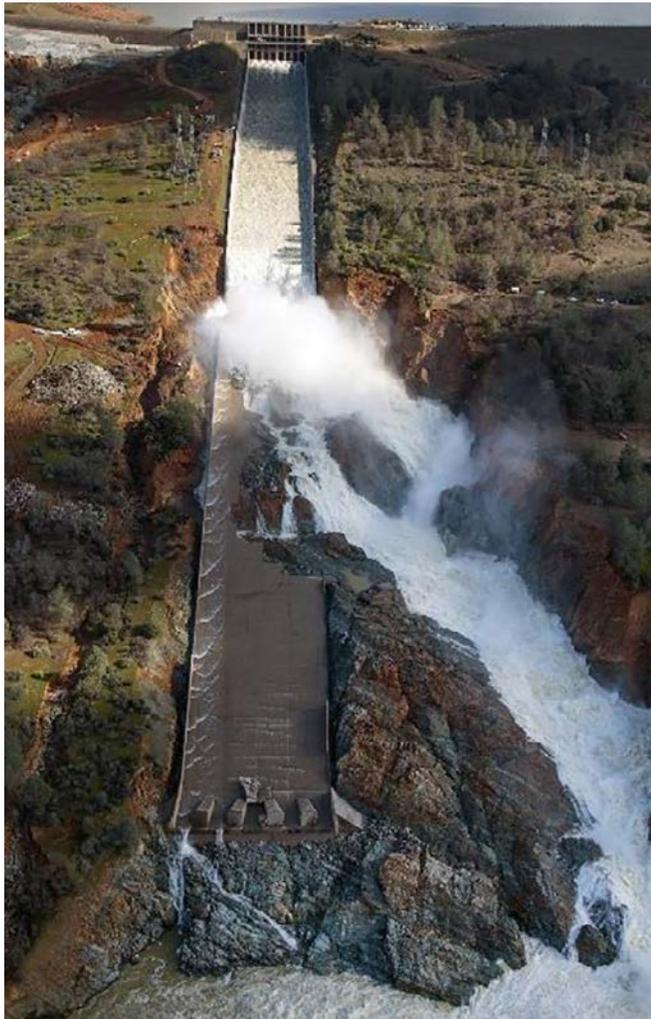
# Dam Safety

## Emergency Action Planning

AECOM's Experience Preparing EAPs



Owners and operators of all dams have a responsibility to make sure their dams perform safely and reliably. Without proper dam safety, the lives and property in communities downstream of dams are at high risk. Most U.S. dams were built more than 50 years ago; due to their age and average life expectancy, they need to be monitored regularly to minimize risk. An important part of dam safety is having an established EAP.



## What are Emergency Action Plans?

Emergency Action Plans are critical components of strong dam safety programs. An EAP is a formal document that defines the action steps a dam owner should take to protect life and property. All dam owners should have an EAP for each of their dams, and keep them up to date.

EAPs generally contain a number of critical elements such as: inundation mapping for evacuation planning purposes; notification flowcharts and emergency manager contact information (methods and procedures to review and update these contacts); response processes; owner responsibilities; evaluation and detection methods; and preparedness activities (on-site or readily available manpower, stockpiled materials and equipment).

## What is the Solution?

AECOM is highly qualified and has significant experience in both developing new EAPs and reviewing and updating existing plans. Our staff has the depth of knowledge to meet the EAP needs of a wide range of dam owners in developing and supporting programs, tools, and procedures that appropriately and effectively meet each client's dam safety concerns.

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Complete and current EAPs are a critical dam safety tool. AECOM has extensive experience preparing EAPs for dams throughout the United States, including a variety of embankment and concrete dams owned by private entities, and local, state and federal governments.

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From top:

**Oroville Dam Spillway Failure (February 2017)**

Butte County, California, USA

*The spillway failure at Oroville Dam in California has exposed the need for immediate inspection of all high hazard dams, re-classification of all state-jurisdictional dams, and preparation of up-to-date inundation mapping and Emergency Action Plans (EAPs) to help dam owners and emergency responders be more prepared.*

**Duckett Dam**

Laurel, Maryland, USA

Cover:

**Rocky Pen Run Reservoir**

Virginia, USA

Each year, AECOM performs services for more than 100 dams including modeling dam breaks, estimating consequences, preparing inundation maps, and developing and exercising EAPs for National Dam Safety Programs for the US Fish and Wildlife Service, Natural Resources Conservation Service, US Army Corps of Engineers (USACE), Bureau of Reclamation (Reclamation), California Department of Water Resources, San Francisco Public Utilities Commission, California American Water Company, and many private owners throughout the US.

## Dam Safety

Our engineers have conducted risk analyses and potential failure mode analyses for more than 30 Comprehensive Facility Reviews for Reclamation and participated in several Reclamation issue evaluation risk analyses, including industry-leading dam safety risk analyses. AECOM has also completed more than 50 quality control and consistency reviews for the USACE and has performed more than 50 detailed dam safety risk assessments for other public and private clients—resulting in a thorough understanding of dam safety risk and risk processes. This understanding has assisted AECOM staff in the development of a series of risk assessment “toolboxes” for the analysis of dams and major federal water resource agency embankments/levees.

## Hazard Classifications

We fully recognize that downstream conditions are not static and that periodic site visits and aerial mapping reviews within a potential downstream inundated area should be performed. Dependent on any changed condition, updated modeling for a dam break analysis may be warranted and the hazard classifications should be reevaluated, as necessary.

## Inundation Mapping

AECOM has performed hydrologic and hydraulic (H&H) and field verification analysis necessary to validate a dam’s current hazard classification. By collecting available existing information (topographic mapping, existing H&H models, existing dam break models and readily available aerial photography) AECOM can reassess current conditions to either validate or reclassify an individual facility.

Field site visits and approved drone overflights may be included to confirm the existence of habitable structures within the downstream floodplain. Field elevations versus modeled flood stages and velocities would be reviewed and confirmed when assigning the current hazard rating.

## Emergency Action Plans

AECOM was selected by the Association of State Dam Safety Officials (ASDSO) to train state dam safety officials, emergency responders, and national dam safety program personnel (Reclamation, USACE, and NRCS) in the development and implementation of EAPs. This ongoing training is designed as an interactive, two-day workshop

that includes developing, implementing, exercising, updating, and reviewing EAPs that work within the constantly changing emergency management community. Since 2006, AECOM has trained nearly 500 dam safety and emergency response personnel in the preparation, testing, and review of EAPs for dams through four nationwide workshops under a contract with ASDSO. Attendees consistently review the workshops as “Excellent.”

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AECOM has developed hundreds of EAPs for dams across the country, and reviewed and updated existing EAPs as part of periodic inspections.

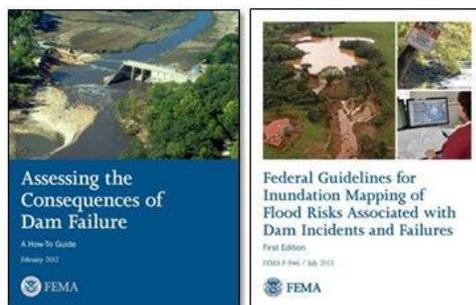
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## Tools and Procedures

AECOM, in concert with Federal Emergency Management Agency (FEMA), developed a GIS toolset named Geospatial Dam Break, Emergency Action Planning, Consequences and Hazards (GeoDam-BREACH).

**GeoDam-BREACH** provides users with a cost-effective methodology for developing consistent, simplified inundation studies and EAPs, and consequently promote dam safety.

An essential component of an effective EAP is to identify the inundated area downstream of the dam to allow the population at risk to be effectively warned, and evacuations and rescue efforts to be planned and executed when needed. Inundation areas can be determined using numerical models, and the level of detail and effort required to develop these models can vary greatly. AECOM is integrating components of GeoDam-BREACH with the Dams Sector Analysis Tool (DSAT).



*Our engineers have worked closely with FEMA to develop tools and procedures that help dam owners establish safety programs.*

## Emergency Planning Experience

AECOM has experience in establishing programs and conducting EAPs throughout the region. Our experience with state dam engineers and safety requirements will help us facilitate a successful EAP for your dam(s).

### Duckett Dam and Brighton Dam, MD

*Client: WSSC*

AECOM completed breach inundation mapping for both dams located in-series, 14 miles apart. We also updated the EAP for Duckett Dam, and developed a specific construction phase EAP for Brighton Dam during the current rehabilitation project. AECOM completed an advanced H&H model using HEC-ResSim to develop a tool which integrates hydrology and hydraulics of the entire affected watershed and allows the owner to predict flood elevations both upstream and downstream of both dams. Using the elevation data, the client can manage the gate operations at both dams to optimize the storage capacity of each dam and minimize the flooding upstream and downstream. The model uses predictive rainfall data to model the two dams working in series so as to provide the least flooding impacts. AECOM designed the remediation of each dam, prepared plans and specifications, provided design services during construction, and resident engineering.

### Rapp Run Dam Pine Run Dam, PA

*Client: Upper Dublin Township, PA*

Prepared new EAPs — including H&H modeling to produce the dam breach inundation mapping — for both new embankment dams. AECOM designed the new structures, prepared plans and specifications, and provided design services during construction.

### Lake Needwood Dam Lake Frank Dam, MD

*Client: Maryland National Park and Planning Commission*

Updated the EAP for these in-series dams, including H&H modeling and new dam breach inundation mapping. AECOM has supported various engineering and environmental tasks in addition to dam safety requirements for these embankment dams located within the Rock Creek Regional Park.

### T. Nelson Elliott Dam, VA

*Client: City of Manassas*

Prepared the EAP, including H&H modeling to produce the dam breach inundation mapping. AECOM designed the remediation of the dam, prepared plans and specifications, provided design services during construction, and resident engineering.



**T. Nelson Elliott Dam**  
Manassas, Virginia, USA

#### Contact:

Dennis Hogan, Regional Dams and Reservoirs Market Sector Leader  
T: +1 215.869.9448 | E: dennis.hogan@aecom.com

For more information,  
please visit [aecomdams.com](http://aecomdams.com)