

Emergency Action Plan Guidelines For High-Hazard Potential Dams

FACT SHEET • Dam Safety

An Emergency Action Plan (EAP) is a formal document that identifies potential emergency conditions at a dam and specifies preplanned actions to be followed to minimize property damage and loss of life in the event of a dam failure. The EAP specifies actions the dam owner should take to moderate or alleviate the problems at the dam. It contains procedures and information to assist the dam owner in issuing an early warning and notification to appropriate emergency management authorities of the emergency situation. It also contains inundation maps to show emergency management authorities critical areas for action in case of an emergency.

When people live in an area that could be flooded due to the failure of a dam, an emergency potential is assumed to exist. An emergency, in terms of dam operation, is an impending or sudden uncontrolled release of water which could result in flooding of downstream property with the potential risk to human life.

Dams are assigned a “high-hazard potential” classification if their failure could potentially result in the loss of human life. An EAP is required for all high-hazard dams.

Six Elements of an EAP

The amount and kinds of development that occur in the floodplain downstream from every dam varies as does the potential for loss of life. Hence, every EAP must be tailored to the site-specific conditions of the floodplain. To accomplish this EAPs generally contain six basic elements that need to be addressed:

- Notification Flowchart
- Emergency Detection, Evaluation, and Classification
- Responsibilities
- Preparedness
- Inundation Maps
- Appendices

All of these elements should be included in a complete EAP. While the dam owner is responsible for the development of the EAP, its development or revision must be done in coordination with those having emergency management responsibilities at the state and local levels. Emergency management agencies will use the EAP to facilitate the implementation of their responsibilities. State and local emergency management authorities will generally have some type of plan already in place, such as a Local Emergency Operations Plan or a Warning and Evacuation Plan.

Notification Flowchart.

The flowchart on the following page shows the appropriate chain of communication for each emergency level. Notification includes local and county emergency management personnel, local and county law enforcement agencies, Oklahoma Water Resources Board Dam Safety personnel, and if appropriate, individuals living within the flood inundation area below the dam as well as the National Weather Service for broadcast on the Emergency Alert System.

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Emergency Detection, Evaluation, and Classification.

Early detection and evaluation of the situation or triggering event that initiate an emergency action are essential. The establishment of procedures for reliable and timely classification of an emergency situation ensures that the appropriate course of action is taken. The Dam Safety Program has developed three emergency levels to accomplish this. Officials should recognize that it is both wise and appropriate to activate the EAP while confirming the extent of the emergency rather than wait for the emergency to occur.

Emergency Level 1: This is a slowly developing non-emergency event. The situation does not threaten the operation or structural integrity of the dam, but may potentially do so if it continues to develop. Dam technical representatives or state dam safety officials should be contacted to investigate the situation and recommend actions to the dam owner. The condition of the dam should be closely monitored, especially during storm events, to detect any worsening of the dam’s condition.



Dam Failure resulting in a sudden uncontrolled release of water

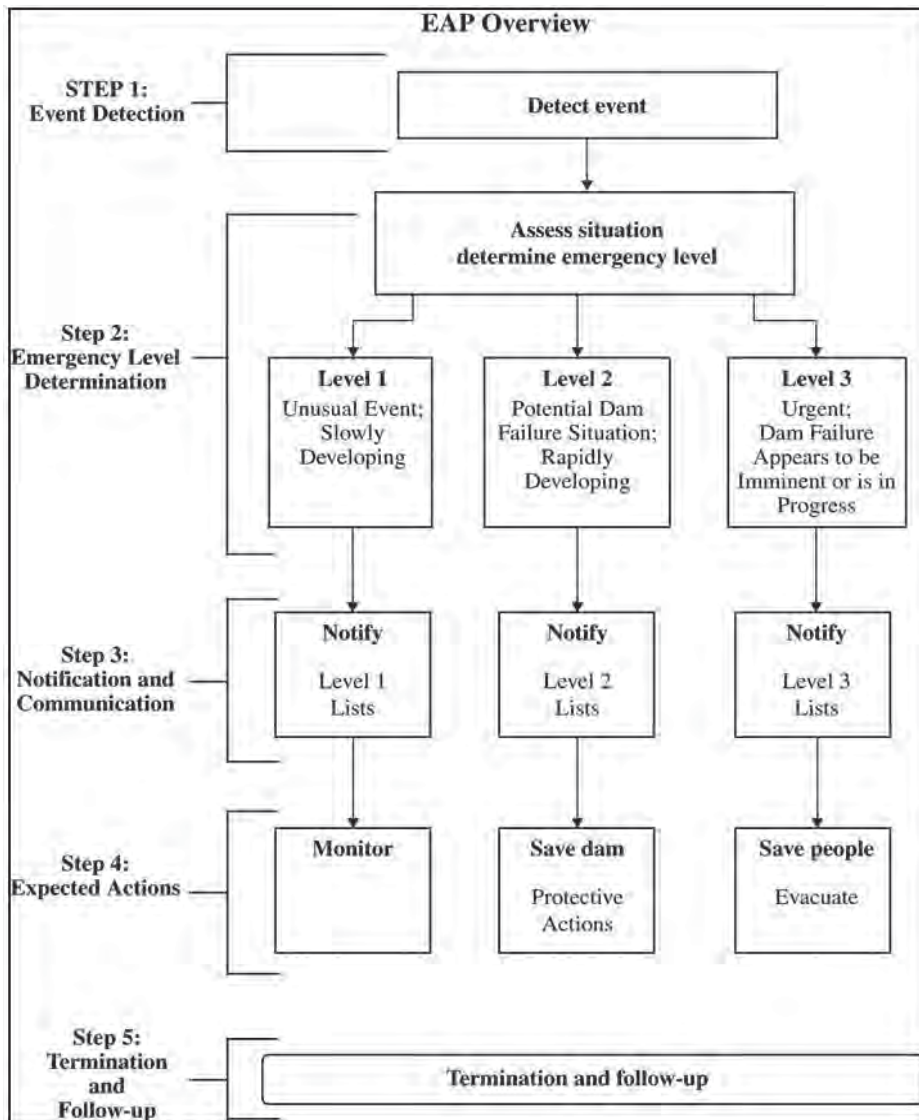


Chart 1: Recommended EAP Flowchart

Emergency management officials should be informed if conditions warrant changing the emergency level status.

Emergency Level 2: While not an immediate threat, there is a rapidly developing situation that may lead to dam failure and flash flooding downstream. The local police or county sheriff and emergency management personnel should be notified of this emergency situation and placed on alert. The dam operator should closely monitor the condition of the dam and periodically report the status of the situation to the appropriate law enforcement officials. If the dam condition worsens and failure becomes imminent, law enforcement and

emergency management officials must be notified immediately of the change in the emergency level to close roads and evacuate people at risk downstream.

If time permits, the dam owner's engineer and state dam safety officials should be contacted to evaluate the site and recommend remedial actions to prevent failure of the dam. The dam operator should initiate remedial repairs as soon as they may safely be accomplished. Time available to employ remedial actions may be hours or days. This emergency level is also applicable when greater than normal releases or flow through the principle and auxiliary spillways have resulted or are expected to result in flooding and lives could be endangered.

Emergency Level 3: This level is an immediate threat. It means that dam failure appears imminent or is in progress. This is an extremely urgent situation that cannot be prevented; flash flooding will occur downstream of the dam. This situation is also applicable when flow through the principal or auxiliary spillway is causing downstream flooding of people and roads. The local police or county sheriff and emergency management personnel should be contacted immediately so emergency services can begin evacuations of all at-risk people and close roads as needed

Responsibilities

A determination of responsibility for EAP-related tasks must be made during the development of the plan. Dam owners are responsible for developing, maintaining, and implementing the EAP. State and local emergency management officials are responsible for warning and evacuation within affected areas. The EAP must clearly specify the dam owner's responsibilities to ensure effective, timely action is taken should an emergency occur at the dam. Tasks of other involved officials are also described in this section.

Preparedness

This section identifies actions to be taken before any emergency. Preparedness actions are taken to alleviate the effects of a dam failure or operational spillway release and to facilitate response to emergencies.

Inundation Maps

An inundation map should delineate the areas that would be flooded as a result of a dam failure. Inundation maps are used both by the dam owner and emergency management officials to facilitate timely notification and evacuation of areas affected by a dam failure or flooding. These maps greatly facilitate notification by graphically displaying flooded areas and showing travel times for wave front and flood peaks at critical locations. Please refer to OWRB's Dam Breach Inundation Mapping Guidelines for more detailed information about these maps.

Appendices

The appendices contain information that supports and supplements the material used in the development and maintenance of the EAP. The following supporting information and documents should be located in the appendices:

In Appendix A:

- Record of revisions and updates made to the EAP
- Contact checklist
- Unusual or emergency event log form
- Dam emergency situation report form

In Appendix B:

- Resources available
- Location and vicinity map
- Dam breach inundation map
- Residents/businesses/highways at risk
- Reservoir elevation-area-volume and spillway capacity data
- National inventory of dam (NID) data
- Plans and drawings of dam

Information in the appendices provides supporting data for emergency responders and is used when communicating emergencies to others. The Location Maps and Dam Breach Inundation Maps are critical to defining the exact site

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location and means of gaining access to the dam. Photographs and schematic plan(s) are helpful for the responders to better understand the conditions at the site. Particular emphasis must be given to identifying those residences or businesses in the inundation area which have people with special needs. Special needs individuals include those with limited English language proficiency, special medical needs, the elderly, people with disabilities, and small children.

Coordination

It is vital that development of the EAP be coordinated with all entities, jurisdictions, and agencies that would be affected by a dam failure and/or flooding as a result of large operational releases, or that have statutory responsibilities for warning, evacuation, and post-flood actions. The finished product should be user friendly as it realistically takes into account each organization's capabilities and responsibilities.

Coordination with state and local emergency management officials at appropriate levels of management responsible for warning and evacuation of the public is essential to ensure that there is agreement on their individual and group responsibilities. Participation in the preparation of the EAP will enhance their confidence the EAP and its accuracy.

Coordination will also provide opportunities for discussion and determination of the order in which public officials would be notified, alternate personnel, alternate means of communication, and special procedures for nighttime, holidays, and weekends. The tasks and responsibilities of the dam owner, law enforcement officials, and the emergency management officials that would be implemented during a dam emergency incident need to be as compatible as possible.

General Responsibilities

The plan should specify the person(s) or organization responsible for the maintenance and operation of the dam and the persons or groups responsible for implementing various phases of the EAP. Some specific responsibilities to be considered are discussed below.

Dam Owner Responsibilities

The duties of the dam owner or owner's designated representatives under the EAP should be clearly described. Include pointers on how to communicate the emergency situation to those who need to be contacted along with samples of typical communications.

The EAP should describe specific actions that will be taken by the dam owner upon notification, such as a certain desired sequence when opening spillway gates, or opening and closing water intakes. Thorough instructions for the operation of the project during an anticipated emergency should be provided.

Dam owners or their representatives who must be notified should be designated and prioritized. This should include supervisory personnel if possible. Dam owners should consider consulting an engineer in regards to remedial actions to delay or alleviate emergency conditions. The responsibilities required by the EAP should be coordinated with appropriate levels of management to ensure full awareness of organizational capabilities and responsibilities. EAPs must always be developed as a result of coordination and consultation with other entities and agencies that will be affected by a failure of a dam, or large operational releases, or have statutory responsibilities in warning and evacuation.

Responsibility for Notification

The person authorized to notify state and local officials should be determined

Particular emphasis must be given to identifying those residences or businesses in the inundation area which have people with special needs

and clearly identified in the EAP. If time allows in an emergency situation, on site personnel should seek advice and assistance. However, under certain circumstances, such as when failure is imminent or has occurred, the responsibility and authority for notification may have to be delegated to the dam operator or a local official. Such situations should be specified in the EAP.

The accurate and timely dissemination of emergency public information is very

important to the overall success of an EAP. The person who is responsible for informing the media and the public throughout the emergency should be designated. The means for keeping local authorities advised of continuing conditions at the dam should also be described.

Throughout the United States, the National Weather Service (NWS) and/or other agencies have the general responsibility for issuing flood warnings. It may be beneficial to include the appropriate agency having this responsibility on the notification chart so that its facilities can enhance warnings being issued.

Local agencies will sometimes establish an Emergency Operations Center (EOC) to serve as the main distribution center for warning and evacuation activities. The availability of specific local resources should be determined through discussion and orientation seminars with local agency personnel. Proper coordination and communication among onsite technical personnel at the dam, public information officer, and emergency personnel at the EOC is of critical importance to a successful EAP.

Responsibility for Evacuation

Evacuation planning and implementation are the responsibility of the state and local officials responsible for the safety of the public who live in the dam breach inundation area. While the dam owner should not usurp the local authorities responsible for evacuation, there may be situations where recreational facilities, campgrounds, or residences may be located beyond the timely reach of authorities. In such cases, the dam owner, or his representatives, may be the most logical person(s) to alert those in danger. In such cases, the EAP should describe these circumstances and indicate who will warn these people and in what priority.

Updating the Plan.

The EAP should be reviewed annually and updated after each change in personnel or their telephone numbers. A comprehensive

review of the adequacy of the EAP should be conducted every five years. During review, an evaluation of any changes in flood inundation areas, downstream developments, or in the reservoir should be made to determine whether any revisions to the current EAP (including inundation maps) are necessary.

If no revision to the plan is necessary, a statement that the review was made and no revision to the EAP was necessary should be included in the EAP. Copies of any revisions that do result from updating the EAP should be furnished to all individuals to whom the original EAP was distributed. It is recommended that the entire EAP be reprinted and distributed to all parties at least every five years even if no revisions have been made.

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Training

Recurring training for the dam operator and alternate(s) is important to ensure that they understand their responsibilities with regard to operating and maintaining the dam and responding to emergencies. The training should provide sufficient information for the dam operators to make knowledgeable, correct, and prompt decisions concerning protection to the downstream residents and property. Both the principal operator(s) and designated alternates should receive operator training in accordance with organizational policy. New operators should be trained before assuming duties at a dam.

There are five types of exercises in a training program. It is not a requirement that every training program include all five exercises. However, it is advisable to build an program upon competencies developed from simpler exercises to achieve greater success with the more complex exercises. This means that emergency exercises should

be developed and conducted in an ascending order of complexity. It is important that sufficient time be provided between each exercise to learn and improve from the experiences of the previous exercise before conducting a more complex exercise. The five exercise types, listed from simplest to most complex, include 1) an orientation seminar, 2) drill, 3) tabletop exercise, 4) functional exercise and 5) a full scale exercise (See FEMA's "Federal Guidelines For Dam Safety: Emergency Action Planning For Dam Owners" for a description of these exercises).

Site-Specific Concerns

Each dam and downstream area is unique. As a result, each EAP is unique. This section of the appendix should provide a discussion of any site-specific concerns that provide valuable information affecting the EAP. The EAP should emphasize where appropriate structural drawings and flood data are maintained at the site. Quick access to this information is crucial during emergency events.

Approval of the EAP

The EAP should include a signature page that is signed by all parties involved in the plan, where they indicate their approval of the plan and agree to their responsibilities for its execution. Including approval signatures helps to assure that all parties understand the EAP and agree to their assigned roles should an emergency occur.

Reference

Federal Guidelines For Dam Safety: *Emergency Action Planning For Dam Owners*, U.S. Department of Homeland Security, Federal Emergency Management Agency, April 2004.



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