Guidelines for Developing Emergency Action Plans for Dams in Texas

Dam Safety Program
Critical Infrastructure Division
Texas Commission on Environmental Quality

GI-394
Revised December 2019

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CONTENTS

Chapter 1. Overview **1**
1.1. Introduction 1
1.2. When Is an Emergency Action Plan Required? 1
1.3. What Is the General Process for Developing an EAP? 2
1.4. What Are the Elements of an EAP? 3
1.5. Acknowledgments 4

Chapter 2. Elements of an Emergency Action Plan **5**
2.1. Title Page 5
2.2. Introduction 5
2.2a. Purpose 5
2.2b. General Description of Dam 5
2.2c. Responsibilities 5
2.3. Notification Flowcharts 5
2.3a. Emergency Conditions 6
2.3b. Flowchart Elements 6
2.3c. Notification Responsibility 6
2.3d. Resources 6
2.4. Inundation Maps 6
2.4a. Generalized Inundation Maps 6
2.4b. Detailed Inundation Maps 7
2.5. Emergency Detection, Evaluation, and Classification 8
2.6. Preparedness 9
2.7. Supplies and Resources 10
2.8. Implementation 10
2.8a. Updating 10
2.8b. Location 10
2.8c. Approval 10
2.8d. Testing 10
2.8e. Training 11

Appendix A: Guidance on Implementing Dam Safety Legislation—Sept. 1, 2013 ..... **13**
Background/Introduction 15
Inspections 15
Dam Evaluation Agreements 16
Exemption Requirements 16
Expiration of Exemption 17
Operation & Maintenance Requirements 17
Modifications to Exempt Dams 17
Statutory Language in HB 2694 and HB 677 19

Appendix B: Guidance on Implementing Dam Safety Legislation—Sept. 1, 2019..... 21
Background/Introduction 23
Emergency Action Plans..... 23
Notification Requirements 23
Submittal Process..... 24
Statutory Language in HB 26 24
Tab 10..... 25

Appendix C: Template for an Emergency Action Plan for a Large Dam..... 27

Appendix D: Template for an EAP for an Intermediate or Small Dam 59

Appendix E: National Weather Service Map 89

Appendix F: Glossary 95

Appendix G: Text Description of Notification Flowcharts 99

CHAPTER 1. OVERVIEW

1.1. Introduction

The primary goal of the state's Dam Safety Program is to reduce the risk to lives and property from the consequences of dam failure. Although most dam owners have a high level of confidence in the structures they own and are certain their dams will not fail, history has shown that on occasion dams do fail and that often these failures cause extensive property damage—and sometimes death. A dam owner is responsible for keeping these threats to a minimum. A carefully conceived and implemented emergency action plan (EAP) is one positive step you, the dam owner, can take to accomplish dam safety objectives, protect your investment, and reduce potential liability.

An emergency action plan is not a substitute for proper maintenance or remedial construction, but it facilitates the recognition of dam safety problems as they develop and establishes nonstructural means to minimize the risk of loss of life and reduce property damage. These guidelines define the requirements of an acceptable EAP and facilitate its preparation, distribution, annual testing, and update.

1.2. When Is an Emergency Action Plan Required?

These guidelines were written to assist dam owners in developing an EAP for their dams. The need for these guidelines was prompted by the state dam-safety regulations (30 TAC 299.6[1]), effective January 1, 2009:

(a) The owners of all high- and significant-hazard dams, as defined in §299.13 of this title (relating to Size Classification Criteria) and §299.14 of this title (relating to Hazard Classification Criteria), shall prepare an emergency action plan to be followed by the owner in the event or threat of a dam emergency.

(b) The owner of an existing high- or significant-hazard dam shall submit the emergency action plan to the executive director for review within two years after the effective date of the rules unless an extension of the time frame is requested and approved by the executive director as described in subsection (d) of this section.

(c) The owner of a proposed high- or significant-hazard dam shall submit the emergency action plan to the executive director before either requesting closure of the dam or upon completion of construction of the dam, if the dam does not require a closure section.

(d) The owner shall prepare the emergency action plan using guidelines provided by the executive director or using a format approved by the executive director before the plan is prepared. If an owner owns more than one dam, the owner shall prepare a plan, with timelines, for preparing emergency action plans based on priority determined by hazard and submit the plan to the executive director for review. If an owner cannot complete the emergency action plan within the two years required in subsection (b) of this section, the owner shall request an extension of time showing cause or a reasonable basis for the need for an extension and providing a time frame to complete. The request shall be submitted to the executive director for review and approval.

(e) The executive director shall review the emergency action plan and provide any comments in writing to the owner.

(f) The executive director shall file the emergency action plan in the agency's confidential, permanent records.

(g) The owner shall review the emergency action plan annually, update the emergency action plan as necessary, and submit a copy of the updated portions of the emergency action plan to the executive director annually beginning three years after the effective date of

1 In this document, "30 TAC [number]" refers to Title 30, Texas Administrative Code, Section (§) (or Subsection, etc.) [number].

this section. If the emergency action plan was reviewed by the owner and no updates were necessary, the owner shall submit written notification to the executive director that no updates to the emergency action plan have been adopted or implemented.

(h) The owner shall perform a table top exercise of the emergency action plan on the frequency provided in the owner's emergency action plan, or at least every five years. A table top exercise is a meeting of the owner and the state and local emergency management personnel in a conference room setting.

An EAP is not required for significant-hazard dams that are exempted under amendments to Texas Water Code (TWC) 12.052 A, made under House Bill 677 from the 83rd Texas Legislative Session, and effective Sept. 1, 2013. Dams that are located on private property, have a maximum impoundment capacity of less than 500 acre-feet, are classified as low- or significant-hazard, and are located in a county with a population of less than 350,000 (per 2010 census), and not located within the corporate limits of a municipality are exempt from safety requirements. Dam owners will still have to comply with maintenance and operation requirements.

Dam owners should refer to Appendix A, "Guidance on Implementing Dam Safety Legislation (September 1, 2013)," to determine if a dam is exempt from the EAP requirement.

1.3. What Is the General Process for Developing an EAP?

Careful research and coordinated planning among all parties will lay the foundation for a thorough EAP. Make use of the portions of these guidelines that apply to your own dam. ***Note:*** **Sample EAPs for large dams and intermediate or small dams are included in the Appendices.**

We recommend that you keep the plan in a three-ring binder, as this will allow the quick and easy replacement of obsolete pages with revised pages.

An owner with several dams in the same area may develop one EAP to cover all of the dams. Such an EAP, however, would have to include a separate description for each dam, as well as a separate inundation or vicinity map (or both) and, possibly, separate notification flowcharts.

Development of an EAP generally follows the steps listed below.

Step 1. Determine the potentially inundated area by defining dam-failure flood profiles downstream from the dam. Conditions to be considered may include:

- dam failure with the reservoir level at normal storage elevation
- dam failure with the reservoir level at the top of the dam
- dam failure with the reservoir level at the level of the design flood

Detailed information on dam failure and inundation analyses can be found in our publication *Hydrologic and Hydraulic Guidelines for Dams in Texas* (GI-364).

The guidelines outline a simplified procedure for estimating breach inundation areas for small and intermediate-size dams and dams with limited downstream development.

Step 2. Prepare inundation maps that clearly depict the flooded areas from a dam failure. For dams with limited downstream development, a generalized inundation map and narrative description may suffice.

Step 3. Identify situations or events that could trigger an emergency condition and require action.

Step 4. Evaluate the warning time available for the various triggering events.

Step 5. Identify all jurisdictions, agencies, and individuals who will be involved in the EAP. Contact the local Emergency Management

Coordinator for assistance. Coordinate the development of the EAP with all involved parties.

Step 6. Identify primary and auxiliary communications systems, both internal (between persons at the dam) and external (between dam personnel and outside entities).

Step 7. List all the persons and entities that must be notified in case of dam distress, prioritize the order of notification, and draft the notification flowcharts.

Step 8. Develop a draft of the EAP. A recommended structure for an EAP is described in the following pages and EAP templates are provided in the appendices.

Step 9. Hold one or more coordination meetings with all local agencies and other parties on the notification list to receive their review and comments for the draft EAP.

Step 10. Submit a draft to the TCEQ Dam Safety Section for review, to the following address:

Dam Safety Section, MC 177
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, TX 78711-3087

Step 11. Make any necessary revisions, obtain the necessary signatures for plan approval, and distribute the EAP to those who have responsibilities under the plan.

Step 12. Review and update the EAP annually. Conduct a tabletop exercise at least once every five years.

1.4. What Are the Elements of an EAP?

The following chapter provides a general description of a typical EAP. Each section of this chapter offers an overview of the purpose, intent, and contents of the corresponding section of the plan. In addition, Appendix C provides an EAP template for a large dam and Appendix D, for an intermediate or small-size dam.

"Size" is defined in 30 TAC 299.13 as follows:

A large-size dam is a dam that has a height equal to or greater than 100 feet or has a maximum capacity equal to or greater than 50,000 acre-feet.

An intermediate-size dam is a dam that has a height equal to or greater than 40 feet and less than 100 feet or has a capacity equal to or greater than 1,000 acre-feet but less than 50,000 acre-feet.

A small-size dam is a dam that has a height equal to or greater than 25 feet and less than 40 feet with a maximum capacity equal to or greater than 15 acre-feet and less than 1,000 acre-feet or a height greater than 6 feet and less than 40 feet with a maximum capacity equal to or greater than 50 acre-feet and less than 1,000 acre-feet.

For additional information on EAPs, see the publication *Federal Guidelines for Dam Safety: Emergency Action Planning for Dam Owners,* which can be found at the FEMA (Federal Emergency Management Agency) website, www.fema.gov (search for the publication by its title).

Note that the Natural Resources Conservation Service (NRCS)–Texas allows the use of either the present guidelines or the NRCS's guidelines in the preparation of EAPs for dams designed and built under the NRCS.

The NRCS provides information on developing EAPs, as well as a "fillable form" and instructions, online at www.ndcsmc.nrcs.usda.gov.

A comprehensive EAP must address the following:

- title page
- purpose
- general description of dam
- responsibilities
- notification flowcharts
- inundation maps

- possible emergency conditions
- preventive actions to be taken
- supplies and resources
- implementation procedures
- any portion of the templates (appendices) that applies

1.5. Acknowledgments

In preparing these guidelines, we have drawn liberally on the work of others.

We express our grateful appreciation to the following agencies, organizations, and firms, all of which supplied valuable information and input:

Agencies

Natural Resources Conservation Service
Federal Emergency Management Agency
Washington State Department of Ecology

Owner

York Creek Improvement District

Consultants

Freese and Nichols, Inc.
Enprotec / Hibbs & Todd, Inc.

CHAPTER 2. ELEMENTS OF AN EMERGENCY ACTION PLAN

2.1. Title Page

The title page must include:

- "Emergency Action Plan" title heading
- Official dam name (as specified in the Texas Inventory of Dams)
- Inventory number
- Owner's name
- Author's name
- Report date

2.2. Introduction

The introduction must briefly describe the purpose of the EAP and provide general information about the dam.

2.2a. Purpose

The purpose of an EAP is to provide a systematic means to:

- Identify emergency conditions threatening a dam.
- Expedite effective responses so as to prevent a dam failure.
- Prevent or reduce loss of life and property damage should a dam failure occur.

This purpose must be stated concisely in the EAP.

2.2b. General Description of Dam

A description of the dam and its location must include:

- name of dam
- name of stream
- location of dam
- latitude and longitude, in decimal degrees
- owner's name, address, and phone number
- type of dam
- size classification
- downstream hazard classification
- dam height, length, and crest width
- spillway types and capacities
- elevation at top of dam and spillway crest
- normal and maximum storage values
- impoundment surface area

2.2c. Responsibilities

This section of the EAP must identify all of the following information:

- Person(s) responsible for the operation and maintenance of the dam.
- Person(s) responsible for observing the dam during extreme flooding events, during holidays, on weekends, and during normal conditions.
- Person(s) responsible for implementing each of the required phases of the EAP.
- Person(s) in charge of emergency response.
- Communication and coordination channels.
- Location of the incident command center or emergency operating center
  and
- Lines of succession and assumptions of responsibility necessary to ensure uninterrupted emergency-response actions under any conditions.

2.3. Notification Flowcharts

As the dam owner, you are responsible for identifying distress conditions at the dam and notifying all the affected political jurisdictions and appropriate state and federal agencies of

such conditions and the possible consequences. Use notification flowcharts to identify the jurisdictions and agencies.

The notification flowcharts must be located near the front of the EAP and be clearly marked with tabs or other means.

2.3a. Emergency Conditions

Typically, the following three emergency conditions are considered:

1. watch
2. possible dam failure
3. imminent dam failure

A minimum of two flowcharts are typically necessary to adequately address the watch and possible or imminent dam-failure conditions.

2.3b. Flowchart Elements

The flowcharts must clearly summarize the following information for each of the three emergency conditions:

- who is responsible for notifying each owner representative and public official
- who is to be notified
- the order in which individuals or offices are to be notified
- individual names; position titles; office, home, mobile, and 24-hour telephone numbers; alternative contacts; and means of communication

2.3c. Notification Responsibility

It is normally the responsibility of local governments or law enforcement agencies, upon receiving such notification, to warn the public, make recommendations about evacuation, carry out the evacuations, and offer shelter to area residents. Sometimes, however, it is more appropriate for the dam owner to warn certain individuals instead of, or in addition to, relying on local government officials, particularly with small dams that may only affect a few people.

2.3d. Resources

When developing notification flowcharts, call the following parties to determine the appropriate contacts and phone numbers for key agencies to be notified in an emergency:

National Weather Service
(See Appendix E for regional contact information)

TCEQ Dam Safety Section
(512) 239-0326 (daytime)
(888) 777-3186 (after hours)

If you contact the National Weather Service while you are developing the EAP, they can assist you with the development of warning messages.

2.4. Inundation Maps

An inundation map is used to depict areas that could flood if a dam fails, and must be included in the EAP. If applicable, inundation maps should include the time to flood (the time from the breach to the time that critical structures are flooded) and the time to peak flow.

The detail and complexity of inundation maps depends on the level of development located downstream from a dam. For small and intermediate dams with limited downstream development, a narrative description of the affected areas and a generalized inundation map noting the potentially impacted downstream structures may suffice. For large and many intermediate-size dams or dams with substantial development downstream, detailed inundation maps may be warranted. The following discussion describes the different types of inundation maps and how they are used in evacuation planning.

2.4a. Generalized Inundation Maps

Development in the floodplain below some dams is sparse and the expense of preparing detailed inundation maps may not be warranted. Instead, a description of the

potential flooding and a generalized inundation map with pertinent information at key locations will suffice. However, if too many hazards and/or unknowns exist, then a generalized inundation map may not be appropriate, and a breach analysis may be necessary.

You can find simplified procedures for estimating dam-failure inundation lengths for existing and proposed small dams and existing intermediate-size dams in *Hydrologic and Hydraulic Guidelines for Dams in Texas* (TCEQ publication GI-364).

Maps from free internet map services (such as Google Maps, Bing Maps, Yahoo Maps, and Map Quest) often have sufficient detail for use as generalized inundation maps. You can also use aerial photographs (preferred), if available with reasonable clarity and scale, as a background for inundation maps. FEMA floodplain maps cannot be used as inundation maps. Additionally, FEMA floodplain limits should not be included in inundation maps.

Aerial maps (and others) for Texas can also be found online courtesy of the Texas Natural Resources Information System, www.tnris.org.

2.4b. Detailed Inundation Maps

A detailed inundation map is prepared using the results of a simplified or full breach analysis performed by a professional engineer. Whenever communities or significant numbers of dwellings are located in the floodplain downstream of a dam, or for large dams with complex floodplains, detailed inundation maps are usually needed for the development of an adequate evacuation plan.

These maps should show an outline of the area that would be inundated in the event of a dam failure at sufficient scale and in enough detail to identify areas, including dwellings, roads, low-water crossings, and other critical structures (schools, assisted-living facilities, hospitals, etc.) likely to be directly affected.

All potential hazards should be clearly labeled/called-out on inundation maps.

You must also include information on approximate depth of flooding and travel time for floods to reach specific locations. (Inundation mapping is described in greater detail in *Hydrologic and Hydraulic Guidelines for Dams in Texas*.) Generally, mapping involves superimposing the inundation area outline on an existing map. Clarity and simplicity are important.

We recommend that you use the best available maps—which can often be aerial photographs, topographic maps, or city street maps—as a basis for your detailed inundation maps. You should also use Light Detection and Ranging (LIDAR) elevation data, where available.

The lines delineating the inundated areas should be thick enough or distinct in form (e.g., solid, dashed, dotted) to identify the dam-failure inundation limits as the main feature of the map, but not so bold that they mask features that would be inundated by a dam failure. If an owner retains an engineer to perform a breach analysis and generate an inundation map, then the owner is encouraged to request/obtain from their engineer the (digital) shapefile(s) that represent the inundation limits, as this will facilitate future annual updates to the EAP that are required.

Please note, however that published maps may not include all recent development; you should therefore take the proper measures to ensure that all the existing structures in the inundation area are identified.

Since local officials are likely to use the inundation maps for evacuation, a note should be included stating the following:

"Because of the method, procedures, and assumptions used to determine the flooded areas, the limits of flooding shown and flood-wave travel times are approximate and should be used only as a guideline for establishing evacuation zones. Areas inundated in

an actual event will depend on actual failure conditions and may differ from areas shown on the maps."

2.5. Emergency Detection, Evaluation, and Classification

The EAP must indicate procedures and list conditions, triggering events, and measures for timely and reliable detection, evaluation, and classification of an existing or potential emergency. The EAP must also incorporate an assessment of the dam, including its vulnerability to all the appropriate known emergency conditions—such as security threats, severe thunderstorms with lightning and excessive rains, hurricanes, tornadoes, and earthquakes—as well as a list and explanation of problem indicators for emergency detection.

The dam owner or responsible agent is responsible for regularly monitoring the condition of the dam and correcting any deficiencies. The plan must include a routine inspection schedule and name the person or position responsible for the inspection. It should also emphasize indicators of the onset of problems that might cause dam failure, such as:

- slumping, sloughing, or slides on the dam or the abutments
- cloudy or dirty seepage or seepage with an increase in flow, boils, piping, or bogs
- seepage around conduits
- cracks, settlement, misalignment, or sinkholes
- erosion or riprap displacement
- animal burrows, especially those associated with beavers or nutria
- growth of trees and brush
- failure of operating equipment
- abnormal instrument readings
- leakage of water into the intake tower or drop inlet
- undermining of spillways
- overtopping of the dam

The EAP must indicate what action you will take and what resources you will use when a situation or indicator is observed, and how quickly you will be able to report the problem. Keep records relating to any of the indicators listed above to determine if changes are occurring. This will permit you to make an informed assessment of the problems and determine the proper implementation of the EAP. However, if you conclude that failure is at all possible, you should immediately implement all the applicable notification procedures and emergency actions.

Emergencies are classified according to their severity and urgency. The EAP must provide classification levels that the dam owner and the emergency management coordinator can understand, to reduce the possibility of them under- or overreacting to an emergency. List the anticipated emergency conditions, such as:

- **Watch Condition.** A problem has been detected at the dam that requires constant monitoring or immediate action to repair or correct. At this time, the distress condition is manageable by dam personnel. The "watch" condition will continue until the problem is corrected or the condition is elevated to a "possible dam failure," and the appropriate warning is issued.
- **Possible Dam Failure Condition.** This is a "watch" condition that is progressively getting worse. Efforts to correct the situation will continue but a possibility now exists that the dam will fail if these efforts are unsuccessful. In other words, there is no immediate danger, but if conditions continue to deteriorate, the dam could fail.
- **Imminent Dam Failure Condition.** The owner or the operator has determined that conditions will progress to failure of the dam and an uncontrollable release of the reservoir. The dam will most likely fail

regardless of what immediate measures are taken.

- **Dam Failure Condition.** The dam has failed and a flood wave is now moving downstream. Flooding will start immediately and will continue to move downstream until water levels at the reservoir are stabilized. Destruction can be expected from the flood wave and the evacuation of downstream areas should continue in accordance with local plans.

2.6. Preparedness

The EAP must describe preparedness actions to be taken both before and following the development of emergency conditions and must identify ways of preparing for an emergency, increasing response readiness in a uniform and coordinated manner, and helping to reduce the effects of a dam failure. The goal is maximum readiness to respond in minimum time.

Preparedness actions involve the installation of equipment or the establishment of procedures for one or more of the following purposes:

- Preventing emergency conditions from developing, if possible, or warning of the development of emergency situations.
- Facilitating the operation of the dam to limit impacts in an emergency situation.
- Minimizing the extent of damage resulting from any emergency situations that do develop.

Because of uncertainties about their effectiveness, preparedness actions designed to be implemented during an emergency situation are usually carried out at the same time as notification is made of an impending failure. **Preparedness actions that occur during or after an emergency are considered emergency repairs and should be undertaken under the direction of the owner's professional engineer or contractor.**

According to 30 TAC 299.45, the TCEQ Dam Safety Section shall be notified of action being taken as soon as the emergency situation allows, but no more than 12 hours after the emergency is discovered. In addition, as soon as the emergency is over, the owner's professional engineer must develop plans for permanent repairs.

There are several types of preparedness actions that you must include in the EAP, including:

- Surveillance. At dams that are normally unattended, give special consideration to providing for full-time surveillance during and after emergencies such as a major flood or earthquake. Since an EAP has little value unless it can be implemented quickly, surveillance at the dam helps ensure enough time to warn the public.
- Response during weekends and holidays. Identify the personnel that will be present and specific actions that are required for emergency response on weekends and holidays.
- Response during periods of darkness and adverse weather. Describe the actions to be taken to illuminate the spillway and distressed areas and to facilitate the operation of gates or other emergency equipment.
- Access to the site. Identify primary and secondary routes for reaching the site under various conditions. Special attention should be given if the main access road crosses the downstream channel, which could be closed by floodwaters.
- Alternative systems of communication. Identify alternative channels of communication to be used in case of failure of the primary system or other systems.
- Lower the reservoir water level. If applicable, describe when and how this action will be taken.

2.7. Supplies and Resources

The EAP must identify all of the following supplies and resources:

- Support capabilities, such as personnel or organizations (including the dam owner's engineer) that can render assistance, and the procedures for contacting them.
- The location of supplies and equipment that are available for use in remedial actions, preferably as close as possible to the dam.
- Procedures for emergency procurement of supplies and equipment needed for remedial actions.
- Remedial construction and other activities that should be done to prevent a failure of the dam, and who will carry them out.

For each applicable item, include specific contact names along with their function, their business or agency, and contact information.

2.8. Implementation

After you complete the draft EAP and before final approval, submit the draft to the TCEQ Dam Safety Section for review and comment. After you receive comments from the TCEQ, revise the EAP and take steps to implement it.

Supply copies of the completed EAP, including the inundation map, to the TCEQ and to appropriate local officials. A copy must also be provided for the local office of the National Weather Service in order to allow development of customized watch and warning messages. (These messages can be used instead of those given as examples in Appendices C and D.)

Schedule briefings with local officials to facilitate the incorporation of information on dam-failure planning in the emergency management plans of local governments.

2.8a. Updating

Update the EAP promptly after each change in personnel involved or in their contact information. Likewise, when there is a significant change in dam operation, downstream development, or other conditions that affect the EAP, you should conduct a comprehensive review of the adequacy of the plan with local emergency management officials.

The EAP must be updated at least once a year, as described in 30 TAC 299.61(g):

(g) The owner shall review the emergency action plan annually, update the emergency action plan as necessary, and submit a copy of the updated portions of the emergency action plan to the executive director annually beginning three years after the effective date of this section. If the emergency action plan was reviewed by the owner and no updates were necessary, the owner shall submit written notification to the executive director that no updates to the emergency action plan have been adopted or implemented.

Establish a procedure to ensure that all the copies of the EAP get revised.

2.8b. Location

A copy of the complete up-to-date EAP must be available to the dam operator, the local emergency management coordinator, and other local officials. The location of each copy must be stated in the EAP.

2.8c. Approval

Include a form on which the dam owner and local emergency-management coordinator sign a statement that they have reviewed the EAP and concur with the notification procedures.

2.8d. Testing

It is required by 30 TAC 299.61(g) that a dam owner review the EAP at least annually. The level of detail and frequency of reviewing depend on the size of the facility and the

complexity of the downstream setting. For small dams and others with only a few homes in the floodplain, a simple review of the EAP, including validating phone numbers on the notification flowcharts, may suffice.

For dams with significant development downstream, a more detailed review is appropriate, such as developing a drill for dam personnel that rehearses the EAP. (Coordinate with state and local officials before performing any test of the EAP.) The review must be conducted annually to keep the owner's employees familiar with the EAP and to eliminate any potential problems. At the same time, the notification procedures must be updated to include any changes in names and telephone numbers of personnel, local officials, and downstream residents, and to include any new problems. Submit revisions of the EAP to the TCEQ and to appropriate state and local government officials.

As stated in 30 TAC 299.61(h), the owner must conduct a tabletop exercise at least once every five years in the form of a meeting with state and local emergency management officials in a conference room. The exercise will begin with a description of a simulated event and proceed to discussions among the participants to evaluate the EAP and response procedures, and to resolve concerns about coordination and responsibilities. The owner must advise the TCEQ's Dam Safety Section of the time and date of the exercise prior to the exercise.

2.8e. Training

Training of the people involved in the EAP should ensure that they are thoroughly familiar with all elements of the plan, the availability of equipment, and their responsibilities and duties. Again, the level of detail involved in training is dependent on the size and complexity of a dam. For small dams with simple EAPs, training may simply involve having responsible persons read the EAP annually.

In the case of larger, more complex dams, training may be much more involved. Training for the employees associated with the dam must be scheduled to familiarize them with the EAP by addressing:

- how to use the EAP
- how to identify problems and their severity
- how to use the notification procedures and the communications equipment
- what resources are available
- the importance of employees' roles during emergencies
- the importance of updating downstream information

You should train enough people to ensure adequate coverage at all times. Exercises simulating dam failures are excellent training mechanisms for ensuring readiness. It is advisable to cross-train individuals for more than one responsible position. Keep a record of training completed by key personnel.

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APPENDIX A

Guidance on Implementing Dam Safety Legislation September 1, 2013

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GUIDANCE ON IMPLEMENTING DAM SAFETY LEGISLATION SEPTEMBER 1, 2013

Background/Introduction

The TCEQ Sunset Legislation, House Bill 2694 from the 82nd Texas Legislative Session, amended Texas Water Code (TWC) § 12.052, Subsection (a), and added Subsections (b-1), (e-1), (e-2), and (e-3). These statutory changes, along with a Sunset Advisory Commission's management directive, require changes to the agency's dam safety program.

House Bill 677 from the 83rd Texas Legislative session further amended Texas Water Code (TWC) § 12.52 Subsection (e-1) and repealed Subsection (e-3).

This guidance document is provided to offer information on these changes which are **effective September 1, 2013**. Included below is information addressing:

- Inspections
- Dam Evaluation Agreements
- Exemption Requirements
- Expiration of Exemption
- Operation & Maintenance Requirements
- Modification to Exempt Dams
- Exemptions for New Proposed Dams
- Sunset Management Directive
- Dam Classifications
- Statutory Language for HB 2694 and HB 677

Inspections

The Texas Commission on Environmental Quality (TCEQ) currently focuses its inspection program of existing dams primarily on high and significant hazard dams as required by rule in 30 Texas Administrative Code (TAC) §299.42(a)(2). According to the rule, high and significant hazard dams and large low hazard dams are scheduled to be inspected every five years, while small and intermediate size, low hazard dams are only to be inspected at the request of an owner; as a result of a complaint; at the request of someone other than the owner; following an emergency such as a flooding event; or for determining the hazard classification.

Beginning **September 1, 2013, the Dam Safety Program will no longer conduct routine inspections of significant hazard dams that meet the criteria specified in TWC § 12.052 (e-1)**. For details on the criteria see "Exemption Requirements" below.

If a dam is identified through review of aerial photographs, topographic maps, or by field observation as being a high hazard due to downstream development, and is currently a low or significant hazard dam or not in the inventory of dams, an inspection will be scheduled with the dam owner.

The Dam Safety Program will focus the review of emergency action plans and hydrologic and hydraulic adequacy only on the high and significant hazard dams not exempted under HB 677.

If a dam is found to have a low hazard classification due to lack of downstream hazard or the dam is found to meet the exemption criteria, the dam will be removed from the inspection schedule, and no additional analyses on the hydrologic and hydraulic adequacy of the dam will be performed.

In addition, an emergency action plan will not be required for significant hazard dams that are exempted under HB 677; however, the owners of those significant hazard dams are strongly

encouraged to develop an emergency action plan for use in an emergency.

Dam Evaluation Agreements

When the Dam Safety Program inspects a high or significant hazard dam, a report is prepared which may include deficiencies that need to be addressed as noted during the inspection and during a file review. If the hydrologic and hydraulic adequacy has not been previously addressed or if the inspection revealed the need for a structural analysis, a recommendation is made for an analysis. The owner will receive a letter and a copy of the report from the TCEQ. If necessary, the owner may be requested to provide a plan of action and timelines for addressing all noted deficiencies.

An agreement may be developed between the TCEQ and the owner to set a timeline to meet the requirements of the rules, but be within the budget of the owner. This written agreement will state the projects to be addressed and the timelines for performance. The agreement may include deferral of an analysis or analyses, if appropriate. The agreement will be signed by the Manager of the Dam Safety Section and the dam owner.

Agreement Request Process:

1) A dam owner interested in establishing an agreement with TCEQ should submit a written request to the Dam Safety Program which includes a detailed plan with proposed time lines for addressing all outstanding issues.
2) Within 45 days of receipt, the Dam Safety Program will evaluate the request. If additional information is needed, program staff may either contact the owner to obtain information, or set up a meeting to discuss the issues with the owner in person.
3) Once all information has been received and evaluated by the Dam Safety Program, either:
   a) the agreement will be drafted and sent to the owner for signature; or
   b) a letter explaining that an agreement is not going to be offered will be sent to the owner. If TCEQ determines that an agreement is not warranted, the owner will be responsible for completing the corrective actions listed in the original inspection report.
4) After the owner has read and signed the agreement, it should be returned to the TCEQ for the Dam Safety Program Manager's signature (the effective date of the agreement is the Dam Safety Program Manager's signature date).

Exemption Requirements

A dam must meet all conditions in TWC § 12.052(e-1) to qualify for the exemption:

- **Privately Owned**
  This does not include dams owned by municipalities, water districts, utility companies, soil and water conservation districts, counties, or state agencies.
- **Maximum capacity less than 500 acre-feet**
  This is the capacity at the top of the dam as defined in 30 TAC §299.2(36). If an owner does not agree with the maximum capacity as recorded in the Dam Safety Program's Inventory of Dams, the owner may submit an evaluation of the capacity conducted by a professional engineer, licensed in the State of Texas, or a registered public surveyor, also licensed in the State of Texas. The Dam Safety Program will review the evaluation and provide a written response within 45 days of receipt.
- **Hazard classification of low or significant**
  30 TAC §299.14 states that the executive director shall classify dams

for hazard based on either potential loss of human life or property damage, in the event of failure or malfunction of the dam or appurtenant structures, within affected developments, that are existing at the time of the classification. For additional details on classifications see "Dam Classifications" below.

- **The dam must be located in a county with a population of less than 350,000**
  The population is based on the 2010 U.S. Census numbers. An exempt county map can be found at www.tceq.texas.gov/compliance/investigation/damsafetyprog.html
- **The dam must be located outside city limits**
  The city limits are based on the most current municipal information (2019). As city limits frequently change, an owner may submit additional information to the TCEQ for consideration.

Expiration of Exemption

The exemption provided in TWC § 12.052(e-1) will not expire as indicated in the previous legislation. The owner of any significant hazard dam found to be exempt under that statute will be informed in writing by the TCEQ regarding the exemption and expiration date.

Operation & Maintenance Requirements

30 TAC §299.41(a) and §299.43(a) require the owners of all dams to operate and maintain the dams in a safe manner and have an operation and maintenance plan. Therefore, TCEQ staff will continue to emphasize this requirement in the Dam Owner Workshops, and all reports will continue to have recommendations for operation and maintenance even if the report is on a low hazard, or exempt dam that was investigated due to a request or a complaint.

If an owner of an exempt dam requests an inspection, the Dam Safety Program will perform the inspection; however, recommendations will be made only on maintenance items.

If an owner of an exempt dam has previously received a request from the TCEQ to provide a plan of action and time line, the owner should proceed with the maintenance work, but the owner will not be required to submit a plan and time line.

Modifications to Exempt Dams

For a significant hazard dam that is exempt under subsection (e-1), if the owner chooses to modify the dam due to previous recommendations by the Dam Safety Program or the owner's engineer, the owner or the owner's engineer should submit the plans and specifications to the Dam Safety Program for review before starting construction, to determine if the modifications will change the hazard classification to high. Within 30 days of receipt, the Dam Safety Program will review and provide comments to the owner or the owner's engineer.

Exemptions for New Proposed Dams

For new proposed dams, there is currently an exemption for any small, low hazard dam which does not require a water rights permit or an Edwards Aquifer Protection Plan, from plan and specification review and construction inspections (30 TAC §299.21). For any new, proposed dam that an owner deems exempt under subsection (e-1), the owner or the owner's professional engineer will need to provide the Dam Safety Program with the necessary information to verify the dam's proposed size and hazard classification before any construction starts.

Sunset Advisory Commission Recommendation

The Sunset Advisory Commission included the following management directive in its decision document: "Direct TCEQ to exempt dams that are classified as low-hazard by TCEQ from adhering to TCEQ's hydrologic and hydraulic criteria."

As a result of this directive, the Dam Safety Program will not make any recommendations regarding hydrologic and hydraulic adequacy for any low hazard dam that may be inspected as a result of a request or a complaint.

Dam Classifications

Low-hazard:

(A) no loss of human life expected (no permanent habitable structures in the breach inundation area downstream of the dam); and

(B) minimal economic loss, located primarily in rural areas where failure may damage occasional farm buildings, limited agricultural improvements, and minor highways (classified by the Texas Department of Transportation as rural collector or local roads, including county roads and Farm-to-Market roads not used to provide service to schools).

Significant-hazard:

(A) loss of human life possible (one to six lives or one or two habitable structures in the breach inundation area downstream of the dam); or

(B) appreciable economic loss, located primarily in rural areas where failure may cause damage to isolated homes; damage to secondary highways (classified by the Texas Department of Transportation as major collector roads, including Farm-to-Market roads used to provide service to schools), damage to minor railroads; or interruption of service or use of public utilities, including the design purpose of the utility.

The dam's hazard designation does NOT include consideration of the physical condition of the dam. The hazard is based on what would be impacted downstream if the dam fails (regardless of its condition).

30 TAC §299.12(b) states that the executive director may reclassify the hazard classification of a dam at any time based on:

1) an inspection and downstream hazard evaluation by the executive director;
2) a report of an inspection and downstream hazard evaluation by the owner's professional engineer;
3) a breach analysis by either the executive director or the owner's professional engineer; or
4) a review of current aerial photography or topographic maps, along with information obtained in the field.

If the owner does not agree with the hazard classification, the owner may request the executive director to reevaluate the hazard classification.

Owners wishing to have their dam's hazard classification reevaluated must submit a request in writing to the manager of the Dam Safety Section. The letter must include supporting information for consideration.

The hazard classification may be reduced if the owner's engineer provides a Dam Breach Analysis which models three breach scenarios (normal storage capacity non-flood event or "sunny day" breach; barely overtopping flood breach, if the dam does not pass the design flood; and design flood breach, showing no adverse impact from any of these breach scenarios on existing downstream improvements.

The TCEQ may also reevaluate the hazard classification as a result of a complaint.

Statutory Language in HB 2694 (82nd Legislature, effective September 1, 2011)

HB 2694 amended Texas Water Code § 12.052 as follows:

(a) The commission shall make and enforce rules and orders and shall perform all other acts necessary to provide for the safe construction, maintenance, repair, and removal of dams located in this state. In performing the commission's duties under this subsection, the commission shall identify and focus on the most hazardous dams in the state

(b-1) The commission may enter into an agreement with an owner of a dam who is required to reevaluate the adequacy of an existing dam or spillway. The agreement may include timelines to achieve compliance with the commission's design criteria and may authorize deferral of compliance with the criteria, as appropriate.

(e-1) The commission shall exempt an owner of a dam located on private property from meeting requirements related to dam safety if the dam:

1) at maximum capacity impounds less than 500 acre feet;
2) has a hazard classification of low or significant;
3) is located in a county with a population of less than 215,000; and
4) is not located inside the corporate limits of a municipality.

(e-2) Notwithstanding Subsection (e-1), an owner of a dam shall comply with operation and maintenance requirements established by commission rule.

(e-3) This subsection and Subsections (e-1) and (e-2) expire August 31, 2015.

Statutory Language in HB 677(83rd Legislature, effective September 1, 2013)

HB 677 amended Texas Water Code § 12.052 as follows:

(e-1) The commission shall exempt an owner of a dam located on private property from meeting requirements related to dam safety if the dam:

(1) at maximum capacity impounds less than 500 acre feet;
(2) has a hazard classification of low or significant;
(3) is located in a county with a population of less than 350,000; and
(4) is not located inside the corporate limits of a municipality.

Section 12.052 (e-3), Water Code, is repealed.

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APPENDIX B

Guidance on Implementing Dam Safety Legislation September 1, 2019

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GUIDANCE ON IMPLEMENTING DAM SAFETY LEGISLATION SEPTEMBER 1, 2019

Background/Introduction

Changes due to House Bill (*HB) 26 affect only intermediate and large-size, state-regulated dams with spillway gates used to regulate flood waters.* This bill, from the 86th Texas Legislative Session, amended Texas Water Code (TWC) Section 12.052, Subsection (a), and added Subsections (a-1), (a-2), (a-3) and (a-4). These statutory changes require changes to the agency's dam safety section.

This guidance document provides information on these changes which are effective September 1, 2019 and a template to use to update the Emergency Action Plan (EAP), as required. Included below is information addressing:

- Emergency Action Plans
- Notification Requirements
- Emergency Action Plan Update
- Submittal Process
- Statutory Language for HB 26
- Notification Template

Emergency Action Plans

Owners of all high- and significant-hazard (non-exempt) dams must prepare an EAP and it must be accepted by the TCEQ Dam Safety Program, as required by rule in 30 Texas Administrative Code (30 TAC) Chapter 299.61. Use guidelines provided by TCEQ to prepare the EAP or use a pre-approved format. The owner should also review the EAP annually and submit a copy of the updated portions (if any) to TCEQ.

Notification Requirements

Effective **September 1, 2019, the owner or operator of an *intermediate or large-size, state-regulated dam with spillway gates used to make releases to regulate flood waters* must notify emergency management officials of downstream communities, who must then notify the public downstream when flood releases are made.** This would include all releases made to regulate flood waters, including any changes in releases that would change the level of potential flooding downstream. **See Tab 10 for the minimum information to provide.**

Notification is not required when releases are made for reasons other than flood control, such as maintenance or testing of gate operations.

Emergency Action Plan Update

To implement this change, applicable dam owners will be required to update their EAP to include a section or tab to address the notification requirement.

Include Tab 10 and a notification flowchart in the updated EAP. See Pages 25 and 26 (sample flowchart). Use the template in Appendix C or D if necessary.

Submittal Process

TCEQ will notify all affected dam owners and provide guidance for developing the notification plans by **January 1, 2020**. Owners will be required to submit an updated draft EAP or addendum to TCEQ by **June 1, 2020**. The draft will be subject to TCEQ review and acceptance.

Statutory Language for HB 26 (86th Legislature, effective September 1, 2019)

Section 1. Section 12.052, Water Code, is amended by amending Subsection (a) and adding Subsections (a-1), (a-2), (a-3), and (a-4) to read as follows:

(a) The commission shall make and enforce rules and orders and shall perform all other acts necessary to provide for the safe construction, operation, maintenance, repair, removal, and emergency management of dams located in this state. In performing the commission's duties under this subsection, the commission shall identify and focus on the most hazardous dams in the state

(a-1) The commission shall require the owner or operator of a state-regulated dam that has a spillway with gates used to regulate flood waters to notify local emergency operation centers in downstream communities when spillway releases are made to regulate flood waters, according to the commission's emergency action plan guidelines.

(a-2) Emergency operation centers notified under Subsection (a-1) shall provide notice to the public when a release may contribute to flooding that may result in damage to life and property through all available means and shall include, at a minimum, the following information, if available:

(1) The names of the dam and reservoir;

(2) The communities downstream that may be impacted and estimated time of impact;

(3) The names of affected river basins and tributaries;

(4) The expected duration of the release;

(5) The level of potential flooding according to the National Weather Service River Forecast Center; and

(6) The roads or bridges that are expected to be affected.

(a-3) A notice provided under Subsection (a-2) must include the following disclaimer: "Actual flood conditions may vary significantly from the alert based on new or changed conditions; advanced alerts of changed conditions may not be possible."

(a-4) Notwithstanding any other defense or immunity that may apply, a notice provided under Subsection (a-1) or (a-2) may not be considered an admission of liability and may not be used as evidence in any suit related to the releases that are the subject of the notice.

Section 2. (a) Not later than January 1, 2020, the Texas Commission on Environmental Quality shall provide guidance for developing a notification plan through a dam owner's emergency action plan for state-regulated dams that have a spillway with gates used to regulate flood waters.

(b) Not later than June 1, 2020, a dam owner or operator shall deliver the notification plan described by Subsection (a) of this section for each dam to the Texas Commission on Environmental Quality.

Section 3. This Act takes effect September 1, 2019.

TAB 10
HB26 Gate Release Notification Template for Flood Conditions

Per HB26 from the 86th Texas Legislative Session, the owner or operator of an intermediate or large-size, state-regulated dam with spillway gates used to make releases to regulate flood waters must notify emergency management officials of downstream communities when flood releases are made. The wording of the message(s) to the public will be left up to the Dam Owner or Operator or the Local Emergency Management Coordinator, but at a minimum must include all the following:

(1) The names of the dam and reservoir.

(2) The communities downstream that may be impacted and estimated time of impact.

(3) The names of affected river basins and tributaries.

(4) The expected volume and duration of the release.

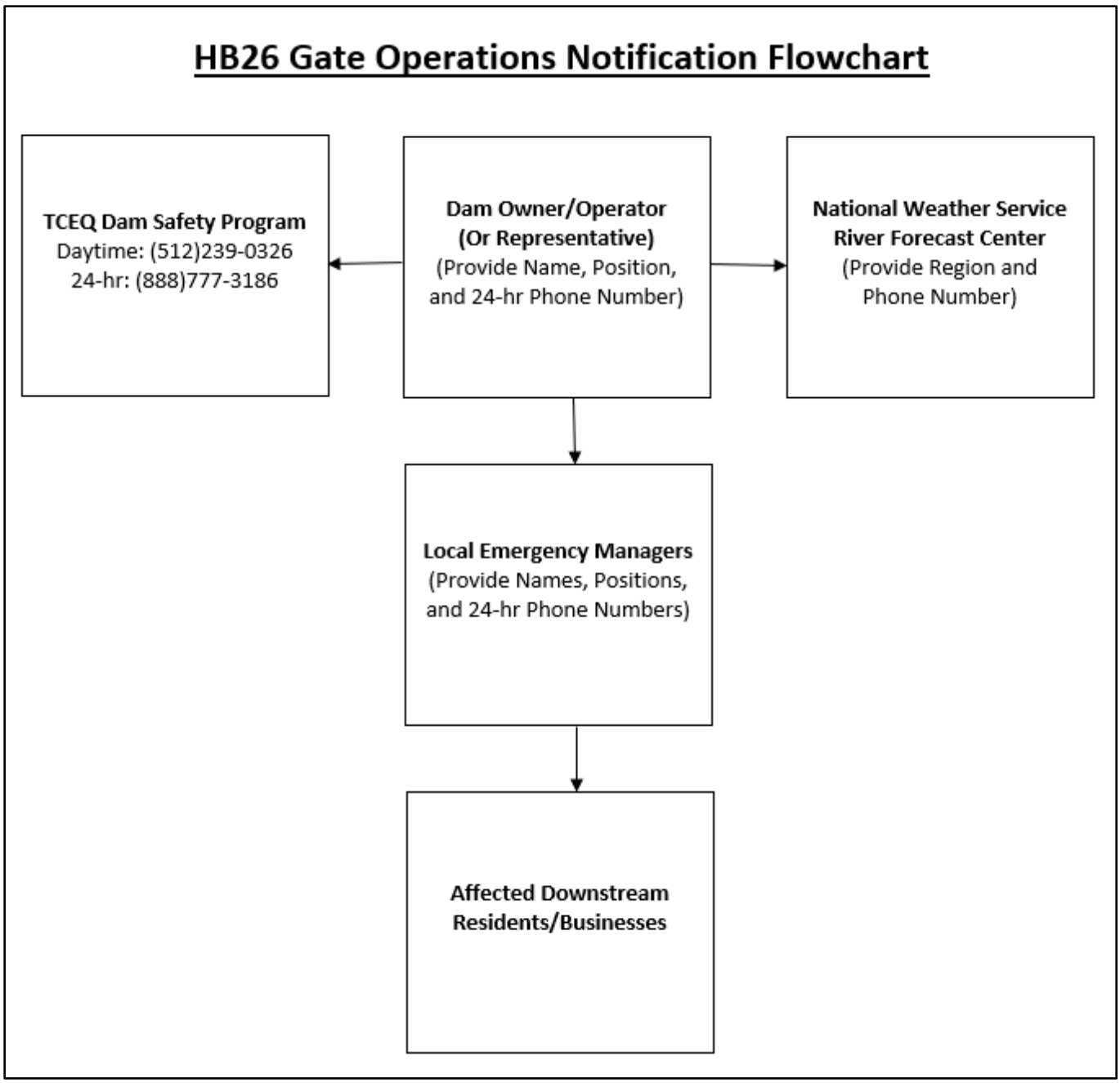
(5) The level of potential flooding according to the National Weather Service River Forecast Center.

(6) The roads or bridges that are expected to be affected.

(7) The following disclaimer: 'Actual flood conditions may vary significantly from the alert based on new or changed conditions; advanced alerts of changed conditions may not be possible'.

Example of an Announcement for a Flood Release

[Owner] is preparing to release flood waters from [Name] Dam, Texas ID [TX#####] as of [time and date]. [Briefly describe the problem or condition leading to the release.] There is no immediate danger of the dam failing. [Describe what communities will be impacted and time of impact, the roads and bridges that are expected to be affected, and which river basin and stream will be affected.] [State the quantity and duration of the releases from the reservoir.] [Describe the level of potential flooding that will be expected according to the National Weather Service River Forecast Center.] Actual flood conditions may vary significantly from the alert based on new or changed conditions; advanced alerts of changed conditions may not be possible.



See Appendix G for the text description of the notification flowchart.

APPENDIX C

Template for an Emergency Action Plan for a Large Dam

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[NAME] DAM

[TX#####]

EMERGENCY ACTION PLAN

[Date]

Prepared for

[Name]

Prepared by

[Name]

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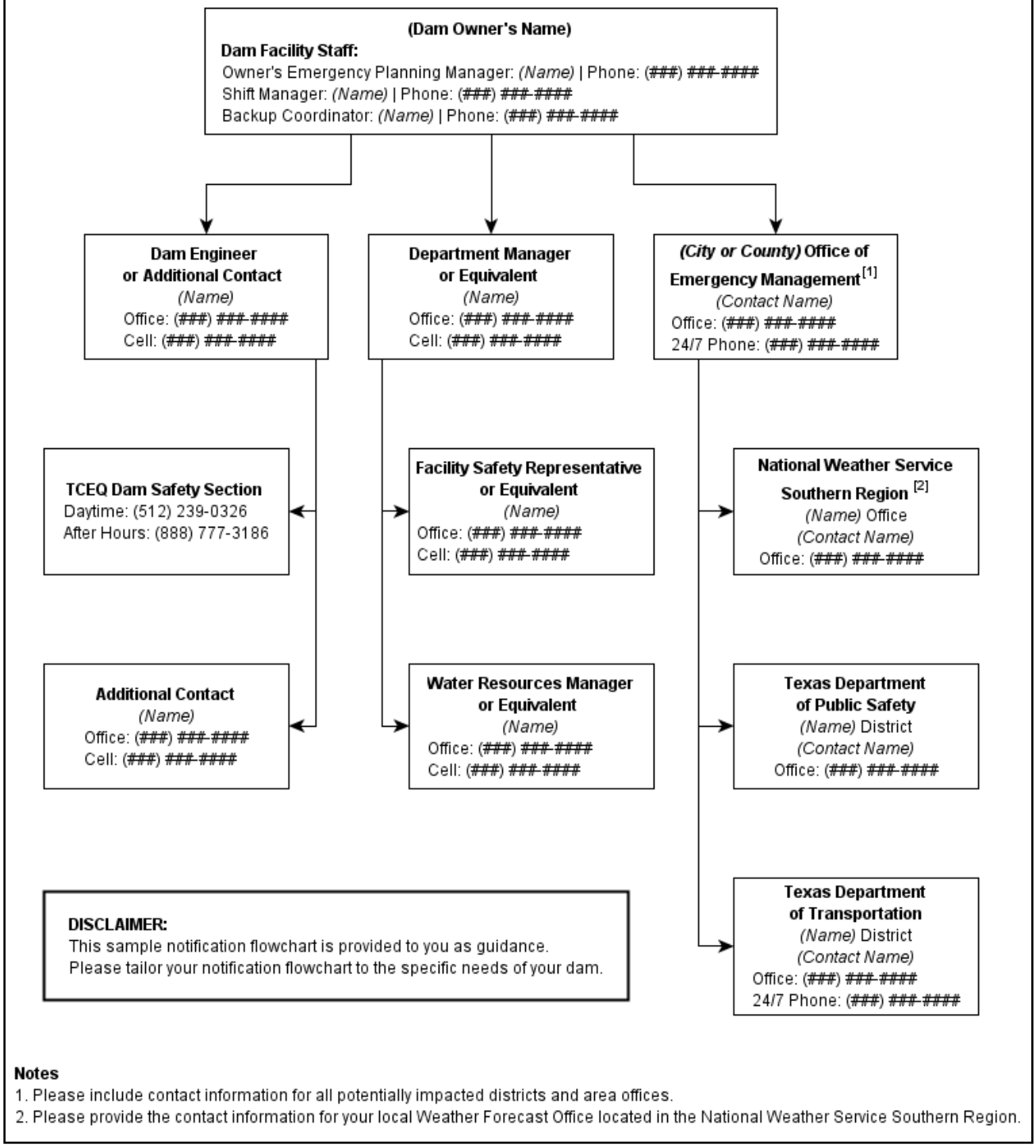
[Name] Emergency Action Plan
[Name] Dam
[Owner], Inc.

Contents

Notification Flowchart (Watch Condition) **33**
Notification Flowchart (Possible, Imminent, or Dam Failure Condition) **34**
EAP Distribution List **35**
Log Sheet of Changes **36**
Approval and Implementation **37**
Emergency Action Plan **38**
1. Purpose 38
2. Dam Description 38
2.1. General 38
2.2. Reservoir Operations 38
3. Responsibilities 38
3.1. Dam Owner's Responsibilities 38
3.2. Responsibilities for Notification 39
3.3. Emergency Operations Center 39
3.4. Responsibilities for Evacuation 39
3.5. Responsibilities for Duration, Security, Termination, and Follow-up 39
3.6. Communications 39
4. Emergency Detection, Evaluation, and Classification 40
4.1. Emergency Detection 40
4.2. Emergency Evaluation and Classification 41
4.3. Previously Known Problems 42
5. Preparedness 42
6. Supplies and Resources 44
6.1. Contracts 44
6.2. Equipment and Supplies 44
6.3. Reports 44
7. Inundation Area 45
7.1. Local Evacuation Plan 45
8. Implementation 46
8.1. Development 46
8.2. Updating 46
8.3. Testing 46
8.4. Training 46
Tab 1 Vicinity Map 47
Tab 2 Inundation Map 48
Tab 3 Dam Description 49
Tab 4 Sample Public Announcements 50
Tab 5 Evidence of Distress 51
Tab 6 Supplies and Resources 55
Tab 7 Annual EAP Evaluation Checklist 56

Tab 8 Plan Review and Update....57
Tab 9 Training Record....58

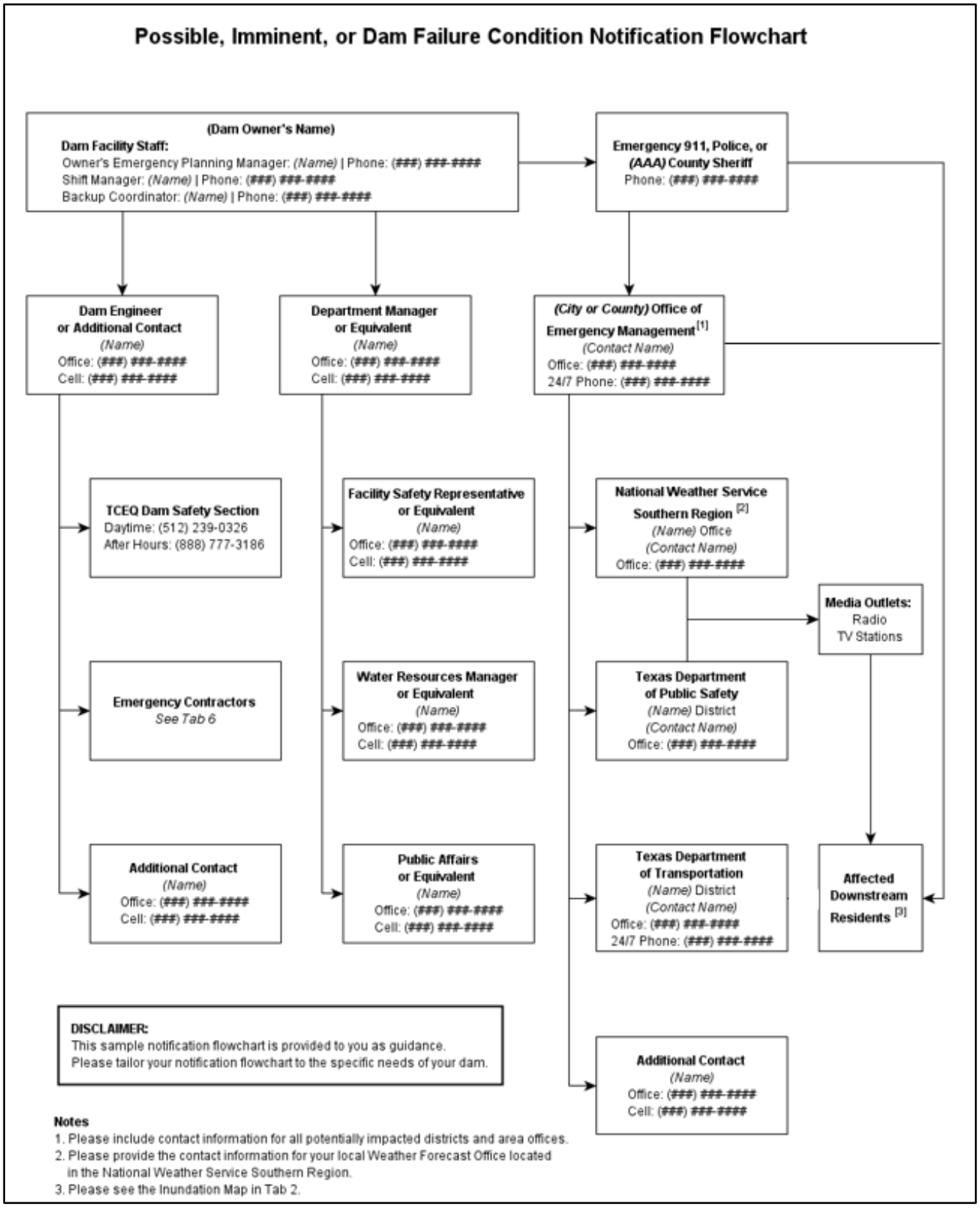
Watch Condition Notification Flowchart



Notes

1. Please include contact information for all potentially impacted districts and area offices.
2. Please provide the contact information for your local Weather Forecast Office located in the National Weather Service Southern Region.

See Appendix G for the text description of the notification flowchart.



See Appendix G for the text description of the notification flowchart.

[NAME] DAM, [TX#####]

EAP DISTRIBUTION LIST

A copy of the EAP has been provided to the following individuals.

Authority	Name, Title, Phone	Address
Owner(s) and Representatives		
Office of Emergency Management [AAA County or AAA City]	Emergency Management Coordinator [Name of Contact] Phone ###-###-####	
Texas Department of Transportation District [###]	[Name of Contact] Phone ###-###-####	
Texas Commission on Environmental Quality	(512) 239-0326 (daytime) (888) 777-3186 (after hours)	Dam Safety Section, MC 177 P.O. Box 13087 Austin, TX 78711
Engineer [Company Name]	[Name of Contact] Phone ###-###-####	

Note: Include information for all counties and districts within the inundation area.

[NAME] DAM, [TX#####]

LOG SHEET OF CHANGES

Date	Change Made	Signature

APPROVAL AND IMPLEMENTATION

EMERGENCY ACTION PLAN

[NAME] DAM, [TX#####]

This Emergency Action Plan is hereby approved. This plan is effective immediately and supersedes all previous editions.

[Name and Title of Appropriate Manager for Owner] Date

I have received a copy of this Emergency Action Plan and concur with the notification procedures.

[Name and Title of Emergency management Coordinator] Date

EMERGENCY ACTION PLAN

[NAME] DAM, [TX#####]

1. Purpose

The purpose of this Emergency Action Plan (EAP) is to identify emergency situations that could threaten [Name] Dam and to plan for an expedited, effective response to prevent failure of the dam and warn downstream residents of impending danger. This plan defines the notification procedures to be followed in the event of a potentially hazardous situation. The procedures are intended to protect lives and prevent property damage from an uncontrolled release of water from the reservoir.

2. Dam Description

2.1. General

[Name] Dam and Reservoir are owned and operated by [Owner]. It is located on [Stream] in [Name] County, approximately [##] miles [direction] of [City], Texas. [Stream] is a tributary of the [Name of Main Tributary], located in the [Name] River Basin. The dam was completed in [year] and was constructed under Permit No. [####], Application No. [####], granted by the Texas Water Rights Commission to Owner in [year]. The lake was constructed to serve as [purpose].

A vicinity map showing the location of the dam can be found in Tab 1. An inundation map illustrating the areas subject to flooding as a result of a dam failure can be found in Tab 2. The inundation area is described in further detail in the Inundation Area section of the report. Lastly, a description of the dam, its spillways, and other features are outlined in the Dam Description in Tab 3.

2.2. Reservoir Operations

[The purpose of this section is to identify features and controls on the dam that would be used to release water and to explain how they would be implemented during an emergency. If the dam does not have any controls, the statement "Releases from the reservoir are uncontrolled" will suffice.]

3. Responsibilities

3.1. Dam Owner's Responsibilities

The owner, [title], is responsible for all dam operation and maintenance. The EAP will not designate a specific person for a specific responsibility but instead will designate the person's duties or job description.

The [Owner's Emergency Planning Manager] is the first line of dam observers and is the person responsible for initiating implementation of the EAP.

The [title] is responsible for conducting routine dam maintenance, such as annual brush control, conducting dam integrity inspections, and notifying [title] of any potential emergency situations. The [title] is responsible for contacting emergency personnel should a dam failure be imminent.

The [title] is responsible for updating the EAP. An annual EAP review will be conducted to ensure that contact names and numbers are current on the Notification Flowcharts.

The [title] is responsible for directing specific, incident appropriate actions during an emergency, such as opening or closing water intakes and remedial construction activities such as dirt moving, etc. Specific scenarios are not listed in this EAP.

3.2. Responsibilities for Notification

The [title] is responsible for inspecting the dam in a potential emergency such as the potential threat of high waters or a tornado. The [title] will contact the [AAA County Sheriff or AAA City Police] and emergency management coordinator.

If warranted, the [title] will notify the TCEQ Dam Safety Section. The [AAA County Sheriff or AAA City Police] will notify downstream residents. The [AAA County or AAA City] emergency management coordinator will implement the Notification Flowchart for regional and state emergency management contacts.

3.3. Emergency Operations Center

In the event of a "possible dam failure" or more serious condition, the [Owner's Emergency Planning Manager] will activate the Emergency Operations Center to serve as the main distribution center for warning and evacuation activities. The Emergency Operations Center will be established at the [location of office]. The [Owner's Emergency Planning Manager] will be responsible for initiating actions from this location.

3.4. Responsibilities for Evacuation

The [AAA County Sheriff or AAA City Police] is responsible for initiating evacuations.

3.5. Responsibilities for Duration, Security, Termination, and Follow-up

The [title] is responsible for monitoring of emergency situations at the dam and keeping authorities informed, based on the Notification Flowcharts.

The [title] and the [title of emergency management coordinator] are responsible for declaring that an emergency at the dam is terminated. Applicable authorities will be notified based on the Notification Flowcharts.

The [title] will ensure that a follow-up evaluation is completed by all participants after the emergency. The results of the evaluation should be documented in a written report and filed with the EAP.

3.6. Communications

Local officials and downstream residents will be notified by landline telephone, if available; otherwise via cell phones or emergency personnel (in person or using their radios). The various radio networks for emergency use include the informal ham-radio network, and networks belonging to:

- The [AAA County Sheriff] or [AAA City Police]
- The [BBB County Sheriff] or [BBB City Police]

- The [CCC County Sheriff] or [CCC City Police]
- The Texas Department of Public Safety
- The Texas Department of Transportation

Sample public announcements appear in Tab 4. Verification or authentication of the situation can be made by contacting the Department of Public Safety District Coordinator office and the [AAA County], [BBB County], and [CCC County] and/or [City of AAA], [City of BBB], and [City of CCC] emergency management officials. Television and radio can be used as much as possible to notify area residents of the possible dangers. Public announcements are to be issued by the [Owner] public affairs officer.

4. Emergency Detection, Evaluation, and Classification

4.1. Emergency Detection

A. Situations

Many dam conditions can lead to emergency situations, not all of which will necessitate the implementation of the EAP. However, if any of them occur, the appropriate actions must be taken.

- **Severe Storms/Inclement Weather:** Although generally not in themselves a threat to the dam, severe storms and other inclement weather conditions can contribute to an existing problem and hinder any remediation efforts. Severe storms also cause the uncontrolled release of floodwater, and increase flow in already rain-swollen areas.
- **Tornadoes:** Tornadoes do occur in the area, with the potential for structural damage to the dam, possibly resulting in its failure. If a tornado has struck in the area, an inspection of the dam for any signs of damage will be appropriate.
- **Earthquakes:** [Dam Name] is located in a seismic zone with low activity. An earthquake is, however, a possibility, and appropriate post-earthquake inspections should be performed.
- **Sabotage:** A threat to damage the dam has been made. Appropriate actions must be taken to protect the dam.

B. Signs of Failure

The [title] is responsible for conducting routine inspections and identifying conditions that could indicate the onset of problems leading to a dam failure. The early identification of potentially dangerous conditions can allow time for the implementation of EAPs. It is important to understand how distress can develop into failure. With appropriate action, distress need not lead to a catastrophic failure of the dam. The following sections describe some of the different types of failure which could lead to a dam failure.

- **Seepage Failure:** Although all earthen embankments allow some minor seepage through the dam or the foundation, excessive, uncontrolled seepage can result in piping (the movement of embankment material in the seepage flow) and lead to failure. Piping can occur for years at a slow rate. If the piping has progressed to a dangerous level, it will be

evident by increased flow or the discharge of muddy water (or both). At that stage, immediate action to stop the piping is needed. Fully developed piping is difficult to control and is very likely to result in failure. A whirlpool in the reservoir is a sign of uncontrollable piping and necessitates immediate emergency action.

- **Embankment or Foundation Sliding:** Sliding is usually first apparent when cracks or bulges in the embankment appear. Slides with progressive movement can cause failure of the embankment.
- **Structural Failure:** The structural failure or collapse of any portion of the principal spillway or spillway gates could result in loss of the reservoir. A structural failure of a portion of the spillway could cause piping and possibly embankment failure.
- **Overtopping Failure:** Overtopping of the embankment results in erosion of the dam crest. Once erosion begins, it is very difficult to stop.

4.2. Emergency Evaluation and Classification

This section lists the conditions and actions which may be used to classify the level of emergency response, as a guide for the [Owner's Emergency Planning Manager]. Specific dam observations and corresponding emergency classification levels can be found in the Evidence of Distress table in Tab 5.

- **Watch Condition:** A problem has been detected at the dam which requires constant monitoring or immediate action to repair or correct. At this time, the distress condition is manageable by dam personnel.

  The [Owner's Emergency Planning Manager] will be responsible for monitoring and repair as soon as possible and implementing the appropriate Notification Flowchart. The following is a list of conditions which constitute "watch" conditions:

  - cloudy or dirty seepage or seepage with an increase in flow, boils, piping, or bogs
  - seepage around conduits
  - large sinkholes with corresponding seepage anywhere on the embankment or downstream from the toe
  - any slide that degrades the crest of the embankment or that is progressively increasing in size
  - cracking or movement of any concrete structure
  - the engagement of the emergency spillway

- **Possible Dam Failure Condition:** A "watch" condition that is progressively getting worse. A situation is developing that could cause the dam to fail. Efforts to correct the situation will continue. There is no immediate danger; however, if conditions continue to deteriorate, the dam could fail.

  The [Owner's Emergency Planning Manager] will be responsible for initiating immediate repairs, including lowering the reservoir if appropriate and implementing the appropriate Notification Flowchart. The following is a list of conditions which constitute "possible dam failure" conditions:

- large boils, increasing in size and flow rate, especially if there is flowing muddy water
- significantly increasing seepage, especially flowing muddy water
- slides involving a large mass of material that impairs the crest of the dam and is continuing to move
- sinkholes with seepage flowing muddy water
- large cracks, movement or failure of a portion of any major concrete structure that forms an integral part of the dam
- an increase in the reservoir level to near the top of the dam
- overtopping of a dam that is not designed for overtopping

- **Imminent Dam Failure/Dam Failure Condition:** The [Owner's Emergency Planning Manager] has determined that a dam failure is occurring or has already occurred and will result in flooding that threatens life and property. No time remains to implement measures to prevent failure. Evacuation has begun and will continue until the situation is stabilized.

  The [Owner's Emergency Planning Manager] is responsible for implementing the appropriate Notification Flowchart. The following is a list of conditions which constitute "imminent dam failure" or "dam failure" conditions:

  - rapidly increasing boils or the presence of new, significantly flowing boils, particularly muddy ones near previously identified ones
  - rapidly increasing seepage, especially flowing muddy water
  - slides involving a large mass of material or which have degraded the crest of the embankment to a level that approaches the water surface level, or if significant seepage is observed through the slide area
  - settlement that is predicted to degrade to the reservoir level
  - cracks that extend to the reservoir level
  - significant movement or failure of any structure that forms an integral part of the dam
  - overtopping of an earthen dam
  - uncontrollable release of the reservoir

4.3. Previously Known Problems

[Identify any known problems with the dam such as those outlined in previous dam safety inspections.]

5. Preparedness

Preparedness actions are to be taken both before and following the development of emergency conditions and should identify ways of preparing for an emergency, increasing response readiness in a uniform and coordinated manner, and helping to reduce the effects of a dam failure. The following are some steps that could prevent or delay failure after an emergency is first discovered.

Surveillance: [title] will monitor the dam during emergency situations such as a severe storm event.

Response during weekends and holidays: [title] will be available for emergency response during weekends and holidays and can be present at the dam site within [# minutes] of detection of an emergency condition.

Response during periods of darkness and adverse weather: [title] will arrange for access to generators and lights to adequately monitor the situation. [title] will be able to access the site during adverse weather conditions by [method of access - i.e. foot, utility vehicle, etc.].

Access to the site: Alternate access routes should be planned in the event of an emergency at the dam. [Example: The road across the dam is a gravel roadway with grassed edges which should allow discharge across the road rendering this route inaccessible. The north and east alternate routes should be used instead under such conditions. All-weather access to the downstream toe of the dam will also be unavailable. For developing situations near the downstream toe of the dam, gravel may need to be brought in to stabilize a road in that area.]

Preventive measures can be taken in an emergency to prevent the catastrophic failure of the dam, but such repairs should be undertaken with extreme caution. The repairs are only temporary, and a permanent repair should be designed by an engineer as soon as possible.

The following actions should only be undertaken under the direction of a professional engineer or contractor. In all cases, the appropriate Notification Flowchart must be implemented and the personnel of the TCEQ Dam Safety Section must be notified.

Consider the following preparedness actions if the dam's integrity is threatened by:

Seepage Failure

- Plug the flow with whatever material is available (hay, bentonite, or plastic) if the entrance is in the reservoir.
- Lower the water level in the reservoir by using the low flow outlet and pumping if necessary, until the flow decreases to a non-erosive velocity or until it stops. Place an inverted filter (a protective layer of sand and gravel) on the exit area to hold the material in place.
- Continue operating at a lower level until a repair is made.

Embankment or Foundation Sliding

1. Lower the water level in the reservoir by pumping if necessary at a rate and to an elevation considered safe, given the slide condition.
2. Stabilize the slide, if on the downstream slope, by weighting the toe area below the slide with soil, rock, or gravel.
3. Continue operating at a lower level until a repair is made.

Structural Failure

1. Implement temporary measures to protect the damaged structure, such as placing rock riprap in the damaged area.
2. Lower the water level to a safe elevation through the low flow release valve and by pumping if necessary.

6. Supplies and Resources

6.1. Contracts

Should [Owner] personnel and resources prove to be inadequate during an emergency, requests will be made for assistance from other local jurisdictions, other agencies, and industry, as needed. Such assistance may include equipment, supplies, or personnel. All agreements will be entered into by authorized officials and should be in writing whenever possible. The [Owner's Emergency Planning Manager] shall have the authority to enter into agreements as deemed necessary to prevent the failure of the dam.

6.2. Equipment and Supplies

Equipment that is available for use and local contractors that can be contacted to provide equipment during an emergency event are listed in Tab 6.

6.3. Reports

Technical Data

Periodic inspections of the dam will be made to evaluate its structural safety, stability, and operational adequacy. In the event of an abnormal occurrence, reference to these reports, particularly the photographs, can be beneficial in the evaluation of a potential problem.

Technical records such as drawings and inspection reports should be stored and carefully maintained at the [Owner] Site offices. Alternate personnel will be familiar with the location of the documents in the event of an emergency situation.

Emergency Operations Center Activity Log

Any unusual or emergency condition should be documented, including the following:

- activation or deactivation of emergency facilities
- emergency notifications to other local governments and to state and federal agencies
- significant changes in the emergency
- major commitments of resources or requests for additional resources from external sources
- telephone calls should be recorded in chronological order
- issuance of protective action recommendations to the public
- evacuations
- casualties
- termination of the incident

Costs of the Emergency Operations Center

For major emergencies, the emergency operations center will maintain detailed records of costs expended. These records may be used to recover costs from the responsible party or insurers, or as a

basis for requesting financial assistance for certain allowable response and recovery costs from the state or federal government. Documented costs should include:

- personnel costs, especially overtime
- equipment operation
- equipment leasing and rental
- contract services to support emergency operations
- specialized supplies expended in emergency operations

7. Inundation Area

The inundation map illustrates the areas subject to flooding from a failure of the dam, and can be found in Tab 2. Also included on the map are the times to flood associated with bridge crossings. The map was prepared using the results of a full breach analysis. Refer to Tab 4 for public announcements (notification message) for various watch/failure conditions.

After examining the results of the breach analysis of [Name] Dam, it has been determined that there were a significant number of structures that could be affected due to a design flood or sunny-day dam breach. These structures are located along the [Stream], the [Stream], and the [Stream]. [City or Town] can suffer a dramatic impact from a breach of the dam. In addition, water resulting from a breach, and associated damages, can, under certain circumstances, travel down the [Stream].

The breach analysis contains profiles of the peak flood levels expected, as well as an estimation of the time from the beginning of the breach to the peak flood elevations. A comparison of the areas that are likely to be flooded with the plots showing the times from the start of the breach to the flooding shows the areas of evacuation and the time constraints involved. Figures in the breach analysis include information on the estimated impact of flooding on the bridges along the [Stream], the [Stream], and the [Stream]. These structures may suffer such impacts before the peak elevation of the flood wave.

7.1. Local Evacuation Plan

If imminent failure of the dam with uncontrolled downstream flooding is anticipated, local emergency management and law enforcement personnel should notify those downstream of evacuation in the most expedient manner possible. The organizations and personnel on the Notification Flowchart should be contacted immediately. Local law enforcement officials, along with radio and television stations, can best spread the notice for evacuation. The immediate impact will be to areas along [Stream] downstream of the dam. For sunny-day and design flood breaches, the following actions should be taken:

- Barricading all bridges that could possibly be flooded to prevent access to the affected area. These bridges include the [Stream] crossings of [Highway or Road]. See the Inundation Map in Tab 2 to determine appropriate barricade locations.
- The Department of Public Safety District Coordinator office can assist with the notification of all persons and agencies involved, with the possibility of additional support—including contacting others not accessible by radio or telephone.

- County officials are generally familiar with developed areas in their jurisdiction. Such knowledge, coupled with the requirements of state law that they respond to disasters, make them the logical officials to be notified and to spread the warning message to all areas subject to flooding.

8. Implementation

8.1. Development

The draft EAP was sent to the TCEQ for review, and agency comments were incorporated into this document, a copy of which is currently on file with TCEQ.

8.2. Updating

Copies of the EAP have been provided to the appropriate individuals and the EAP has been approved and signed by the owner and emergency management coordinator, as shown on the Distribution List and Approval and Implementation sheets at the front of the report. This plan will be reviewed and updated annually by [Owner's Emergency Planning Manager] and personnel from local emergency management agencies in conjunction with [Owner's Emergency Planning Manager]'s annual maintenance inspection of the dam. The [Owner's Emergency Planning Manager] will review and complete all items on the Annual EAP Evaluation Checklist in Tab 7. After the annual update is complete, a new Approval and Implementation sheet will be attached and the annual update will be documented on the Plan Review and Update sheet in Tab 8.

If revisions to the EAP are made as a result of the annual update, such changes will be recorded on the Log Sheet of Changes form at the front of the report. A copy of the updated portions of the EAP will be sent to TCEQ. If the EAP was reviewed and revisions were not required, the [Owner] will submit written notification to the TCEQ that no updates to the EAP have been adopted or implemented.

8.3. Testing

A table top exercise will be conducted at least once every five years. The table top exercise involves a meeting of [Owner's Emergency Planning Manager] with local and state emergency management officials in a conference room. The exercise begins with a description of a simulated event and proceeds with discussions by the participants to evaluate the EAP and response procedures, and to resolve concerns regarding coordination and responsibilities. Any problems identified during an exercise should be included in revisions to the EAP. Records of training and testing exercises will be resolved and maintained in Tab 9.

8.4. Training

All people involved in the EAP will be trained to ensure that they are thoroughly familiar with its elements, the availability of equipment, and their responsibilities and duties under the plan. Personnel will be trained in problem detection, evaluation, and appropriate corrective measures. This training is essential for proper evaluation of developing situations at all levels of responsibility. Training records will be maintained in Tab 9.

TAB 1
VICINITY MAP

The purpose of the vicinity map is to show the location of the dam and surrounding roads that provide access to the dam. USGS topographic maps, county road maps, city street maps, or free Internet mapping applications such as Google Maps, Bing, Yahoo, or Map Quest can be used to produce the vicinity map. An example is shown below.

The vicinity map must include the following features:

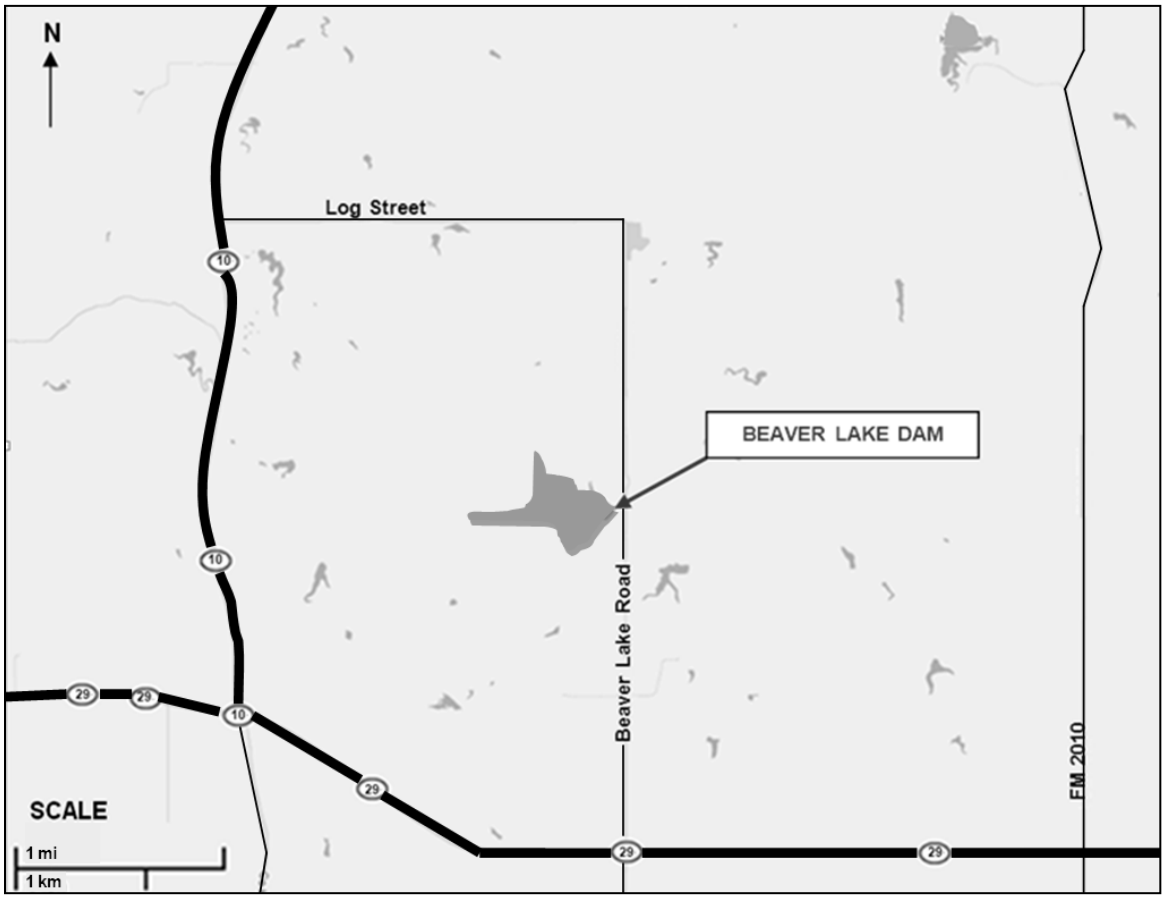
a. Show the location of the dam in relation to major roads (highways, farm to market, county roads, etc.), intersections, and landmarks in the area.

b. Label all applicable street names.

c. Label the dam.

d. Include a north arrow.

e. Scale the map appropriately to ensure all applicable features are visible. Include a scale bar.



Example - Vicinity Map

TAB 2
INUNDATION MAP

An inundation map is used to depict areas that could potentially flood if a dam fails. The inundation map should be used for evacuation planning. **All dams require an inundation map**, but the level of detail required on the map depends on the size of the dam and complexity of the floodplain conditions. Use the best available maps, including USGS topographic maps, county road maps, city street maps, aerial photography, and other sources of topographic information. At a minimum, the inundation map for a large dam must include:

Detailed Inundation Map (For dams with significant numbers of structures downstream or complex floodplains. Must be prepared using the results of a full breach analysis performed by a professional engineer):

a. Label the dam.

b. Label all applicable street names.

c. Label all applicable river/stream names.

d. Include a north arrow.

e. Scale the map appropriately to ensure all applicable features are visible. Include a scale bar.

f. Use USGS topographic maps, aerial photography, and other sources of topographic information to show the affected areas of development.

g. Label the potential hazards that could be affected by a dam failure.
   - Call out affected roads and low-water crossings.
   - Label potentially affected structures with street addresses. If the inundation area includes dense development, individual labels for affected structures are not required. Label developed areas, critical structures, and major roads as needed. (i.e. subdivision names, schools, hospitals, highways)

h. Clearly delineate the boundary of the breach inundation area. Do not show any non-breach runs on the inundation map that is included with the EAP. Only show sunny day and design breach runs.

i. Label the time to flood (time from the breach to the time critical structures and roads are flooded).

j. Label the time to peak flow.

k. Include a note that states "Because of the method, procedures, and assumptions used to determine the flooded areas; the limits of flooding shown and flood wave travel times are approximate and should be used only as a guideline for establishing evacuation zones. Areas inundated in an actual event will depend on actual failure conditions and may differ from areas shown on the maps."

TAB 3
DAM DESCRIPTION

Official Dam Name [1]: _____

Dam Location: _____

Latitude/Longitude: _____

Dam Owner: _____ Phone Number: _____

Dam Owner's Address: _____

Embankment

Type	_____ (ex.–earthen embankment)
Year Constructed	_____
Length	_____ feet
Maximum Height	_____ feet
Top Width	_____ feet
Top of Embankment Elevation	_____ feet-msl
Drainage Area	_____ square miles

Principal Spillway [2]

Type	_____ (ex.–Uncontrolled ogee weir)
Location	_____ (ex.–Right abutment)
Crest Length	_____ feet
Crest Elevation	_____ feet

Emergency Spillway

Type	_____ (ex.–Excavated, broad-crested weir)
Location	_____ (ex.–Left abutment)
Crest Length	_____ feet
Crest Elevation	_____ feet-msl

Inlet-Outlet Works

Type	_____
Location	_____ (ex.–Right end of the dam)
Invert Elevation (Inlet)	_____ feet-msl (bottom of pipe)
Invert Elevation (Outlet)	_____ feet-msl (bottom of pipe)

Reservoir

Elev. Top of Conservation Pool	_____ feet-msl
Capacity Conservation Pool (Normal Pool)	_____ acre-feet
Capacity at Top of Dam (Maximum)	_____ acre-feet
Surface Area	_____ acres

(1) If the dam is known by more than one name, it is recommended that all names be listed (i.e. Official TCEQ name, City name, common name known by locals, etc.)

(2) If the dam has multiple spillways, create additional subsections as necessary to include information on all spillways.

TAB 4

SAMPLE PUBLIC ANNOUNCEMENTS

Note: These messages are communicated to downstream residents to alert the public of impending danger. The [Owner] should coordinate with the National Weather Service, the Department of Public Safety [Location] District Coordinator office, and the Emergency Management Coordinators for [AAA, BBB, and CCC County] prior to release. Messages developed with the assistance of the National Weather Service may be used instead, which can be communicated via radio, television, and other media outlets.

Announcement for a Slowly Developing "Watch" Condition

[Owner] has declared a "Watch" condition for [Name] Dam, Texas ID [TX#####] as of [time and date]. [Briefly describe the problem or condition.] There is no immediate danger of the dam failing; however the potential does exist. [Describe what actions are being taken to monitor and control the situation.] [State the quantity of any releases from the reservoir.]

Announcement for a Possible Dam Failure

This is an emergency message. [Owner] has declared a possible dam failure at [Name] Dam, Texas ID [TX#####] as of [time and date]. [Briefly describe the problem or condition.] It is possible the dam could fail. Attempts to save the dam are under way, but their success cannot be determined as yet. [Describe what actions are being taken to monitor and control the situation.] [State the quantity of any releases from the reservoir.] Additional news will be made available as soon as it is received.

Announcement for an Imminent Dam Failure

Urgent! This is an emergency message. [Owner] has announced that [Name] Dam, Texas ID [TX#####] is in imminent danger of failing. [Describe what actions are being taken to monitor and control the situation.] It is possible that the dam will fail in [##] hours. Residents in low lying areas along the [Stream], the [Stream], and the [Stream], as well as the town of [Name], should prepare for immediate evacuation. Additional news will be made available as soon as it is received.

Announcement of a Dam Failure

Emergency! This is an emergency message. [Name] Dam, Texas ID [TX#####] failed at [time and date]. Residents who have not yet done so should immediately evacuate the city of [Name] and low-lying areas along the [Stream], the [Stream], and the [Stream]. The flood waters have already reached [Highway] and [Road]. Additional news will be made available as soon as it is received.

TAB 5
EVIDENCE OF DISTRESS

General Observation	Specific Observation	Condition	Emergency Action	Equipment, Material and Supplies	Data to Record
Boils	Small boils, no increase of water flow, flowing clear water	Watch	Closely check all of downstream toe, especially in the vicinity of boil for additional boils, wet spots, sinkholes, or seepage. Closely monitor entire area for changes or flow rate increases.	None	Site and location, approximate flow
	Large or additional boils near previously identified ones, without increasing flow rate, but carrying small amount of soil particles	Watch	Initiate 24-hour surveillance. Monitor as described above. Construct sandbag ring dikes around boils, to cover them with water to retard the movement of soil particles. Filter cloth may be used to retard soil movement, but do not retard the flow of water.	Sandbags, filter cloth	Site and location, approximate flow
	Large or additional boils near previously identified ones, increasing flow rate, carrying soil particles	Possible Failure	Continue 24-hour surveillance. Continue monitoring and remedial action as described above. Initiate emergency lowering of the reservoir. Issue a warning to downstream residents.	Sandbags, pump	Site and location, approximate flow
	Rapidly increasing size of boils and flow increasing and muddy water	Imminent Failure	Downstream evacuation. Employ all available equipment to attempt to construct a large ring dike around the boil area.	Dozer, shovels, source of earthfill	Site and location, approximate flow
Seepage	Minor seepage of clear water at toe, on slope of embankment, or at the abutments	Watch	Closely check entire embankment for other seepage areas. Use wooden stakes or flagging to delineate seepage area. Try to channel and measure flow. Look for upstream whirlpools.	Wooden stakes, flagging	Site, location, approximate flow
	Additional seepage areas observed flowing clear water and/or increasing flow rate.	Watch	Initiate 24-hour surveillance. Monitor as described above. Construct measuring weir and channel all seepage through weir. Attempt to determine source of seepage.	Dozer, shovels	Site, location, approximate flow
	Seriously or rapidly increasing seepage, underseepage, or drain flow.	Possible Failure	Continue 24-hour monitoring and remedial action as described above. Initiate emergency lowering of the reservoir. Construct a large ring dike around the seepage area.	Dozer, shovels, source of earthfill	Site location, approximate flow
	Additional seepage areas with rapid increase in flow and muddy water.	Imminent Failure	Downstream evacuation. Employ all available equipment to attempt to construct a large ring dike around the seepage area.	Dozer, shovels, source of earthfill	Site location, approximate flow

TAB 5 (CONTINUED)

EVIDENCE OF DISTRESS

General Observation	Specific Observation	Condition	Emergency Action	Equipment, Material and Supplies	Data to Record
Slides or severe erosion	Skin slide or slough on slope of embankment. No further movement of slide and embankment crest not degraded.	Watch	Examine rest of embankment for other slides. Place stakes in slide material and adjacent to it for determining if further movement is taking place.	Stakes, tape measure	Distance between stakes
	Slide or erosion involving large mass of material, crest of embankment is degraded, no movement or very slow continuing movement.	Watch	Initiate 24-hour surveillance. Mobilize all available resources and equipment for repair operations to increase freeboard and to protect the exposed embankment material. Start filling sandbags and stockpile near slide area.	Dozer, shovels, sources of earthfill, sandbags	Distance between stakes
	Slide or erosion involving large mass of material, crest of embankment is degraded, progressively increasing in size.	Possible Failure	Continue monitoring and remedial actions as described above. Place additional material at the toe of the slope to stop the slide.	Dozer, shovels, source of earthfill, pump	Distance between stakes
	Slide or erosion involving large mass of material, crest of embankment is severely degraded, movement of slide is continuing and may reach pool level.	Imminent Failure	Downstream evacuation. Utilize all available equipment and personnel to sandbag the degraded slide area to prevent it from overtopping.	Dozer, shovels, sandbags, pump	Distance between stakes
Sinkholes	Sinkholes anywhere on the embankment or within 500 feet downstream from the toe.	Watch	Carefully walk the entire embankment and downstream area looking for additional sinkholes, movement, or seepage.	Stakes, flagging	Size, location
	Sinkholes with corresponding seepage anywhere on the embankment or downstream from the toe.	Watch	Initiate 24-hour surveillance. Monitor as above. Construct sandbag dike around the seepage exit point to reduce the flow rate. Start filling sandbags and stockpile near sinkhole.	Dozer, shovels, pump	Size, location
	Large sinkholes with corresponding seepage anywhere on the embankment or downstream from the toe.	Possible failure	Continue monitoring and remedial action as described above. Utilize sandbags to increase the freeboard on the dam if necessary.	Sandbags, dozer, pump	Size, location
	Sinkholes rapidly getting worse, seepage flowing muddy water and increasing flow.	Imminent failure	Downstream evacuation. Utilize all available equipment and personnel to attempt to construct a large ring dike around the area.	Dozer, shovels, pump	Size, location

TAB 5 (CONTINUED)

EVIDENCE OF DISTRESS

General Observation	Specific Observation	Condition	Emergency Action	Equipment, Material and Supplies	Data to Record
Settlement	Obvious settlement of the crest of the embankment, especially adjacent to concrete structures.	Watch	Look for bulges on slope or changes in crest alignment.	None	Size, location
	Settlement of crest of embankment that is progressing, especially adjacent to concrete structures or if any corresponding seepage is present.	Watch	Initiate 24-hour surveillance. Mobilize all available resources for repair operations to increase freeboard. Fill and stockpile sandbags. Identify any boils near settlement points for flowing material and pursue action for boils.	Sandbags, dozer, shovels, source of earthfill	Size, location
	Settlement of crest of embankment that is rapidly progressing especially adjacent to concrete structures or if any corresponding seepage is flowing muddy water or increasing flow.	Possible failure	Continue monitoring and remedial actions as described above. Use sandbags to increase the freeboard on the dam if necessary.	Sandbags, shovels, dozer, source of earthfill	Size, location
	Progressing settlement that is expected to degrade the embankment to reservoir level.	Imminent failure	Downstream evacuation. Utilize all available equipment and personnel to build up the crest in the area that is settling. Identify any boils near settlement points for flowing material and pursue action for boils.	Dozer, shovels, source of earthfill, sandbags	Size, location
Cracking	Cracks in the embankment crest or on slopes.	Watch	Walk on entire crest and slope and check for additional cracking.	Stakes, tape measure	Size, location
	Numerous cracks in crest that are enlarging, especially those perpendicular to the centerline of the dam.	Watch	Initiate 24-hour surveillance. Carefully monitor and measure cracking to determine the speed and extent of the problem. Mobilize to fill cracks. Cracks parallel to the centerline indicate a slide. Follow remedial action for slides.	Stakes, tape measure, dozer, shovels, source of earthfill	Size, location
	Large cracks in the crest that are rapidly enlarging, especially those perpendicular to the centerline of the dam.	Possible failure	Continue monitoring and remedial action as described above.	Dozer, shovels, source of earthfill	Size, location
	Cracking that extends to pool elevation.	Imminent failure	Downstream evacuation. Continue remedial actions as described above.	Dozer, shovels, source of earthfill	Size, location

TAB 5 (CONTINUED)
EVIDENCE OF DISTRESS

General Observation	Specific Observation	Condition	Emergency Action	Equipment, Material and Supplies	Data to Record
Cracking or movement of concrete structure	Minor cracking and/or movement.	Watch	Immediately install measuring device to monitor movement.	Crack Monitors, stakes, tape measure	Size, location
	Significant cracking and/or movement.	Watch	Initiate 24-hour surveillance. Lower burlap on upstream face of crack to reduce flow of soil particles. Dump rockfill downstream of moving concrete structure monolith to resist the movement.	Burlap, rockfill, dozer, shovels	Size, location, flow rate
	Serious cracking and/or movement	Possible failure	Continue monitoring and remedial action as described above.	Dozer, rockfill, burlap, crack monitors	Size, movement, flow rate
	Major cracking and/or movement	Imminent failure	Downstream evacuation. Continue monitoring and remedial actions as described above.	Dozer, shovels, rockfill	Size, location, flow rate
Upstream Whirlpool	Whirlpool in the lake in the vicinity of the embankment	Imminent Failure	Downstream evacuation. Attempt to plug the entrance of the whirlpool with riprap from the slope of the embankment. Search downstream for an exit point and construct a ring dike to retard the flow of soil particles.	Dozer, source of earthfill, sandbags, filter cloth, straw, rocks	Size, location, flow rate
Broken gate	Structural member of a gate or gate operator broken or severely damaged so as to prevent operation of the gate	Possible failure	Initiate 24-hour surveillance. Immediately place stop logs in front of gate and initiate necessary actions to get gate repaired.	Crane and welder	Type of problem, location
Rapidly rising lake	Lake level rising and rain continuing	Watch	Initiate 24-hour surveillance of lake level and rainfall.		Lake level, rainfall
Dam being overtopped	Water flowing over the dam and lake continuing to rise	Possible failure	Downstream evacuation. Continue monitoring.		Lake level, rainfall

TAB 6
SUPPLIES AND RESOURCES

The following equipment and supplies may be necessary for use during a dam emergency. Contact information for local contractors who can provide the following items during an emergency is listed below. For supplies owned by the dam owner, the dam owner's name and the specific location of the supplies have been denoted.

EQUIPMENT/SUPPLIES	LOCATION
Backhoes Dump trucks Portable welding equipment Generators Bulldozers Excavators Loaders Motor graders	[Names, addresses, and phone numbers of contractors]
Crane	[Names, addresses, and phone numbers of contractors]
Sandbags	[Names, addresses, and phone numbers of suppliers]
Rock riprap	[Names, addresses, and phone numbers of suppliers]
Fill Material	[Names, addresses, and phone numbers of suppliers]
Other - _____	[Names, addresses, and phone numbers of suppliers]

TAB 7

ANNUAL EAP EVALUATION CHECKLIST

Was the annual dam inspection conducted?	□ Yes □ No	If yes, has the EAP been revised to include any signs of failures observed during the inspection?	□ Yes □ No
Was brush clearing, animal burrow removal, or other maintenance required?	□ Yes □ No	If yes, describe actions taken and date:	
Was the outlet gate operable?	□ Yes □ No	If no, describe actions taken and date:	
Do the Notification Flowcharts require revision? (Note that revision of the contact information will not require EAP approval; however, the revised contact information pages will need to be redistributed as a replacement pages.)	□ Yes □ No	If yes, list the dates of the contact information revision and redistribution:	
Was annual training or an exercise conducted?	□ Yes □ No	Circle: training exercise Date conducted:	
Are inspection and training records included in the EAP?	□ Yes □ No		
Was the EAP reviewed?	□ Yes □ No	If yes, review date:	
Were changes required to the EAP?	□ Yes □ No	If yes, date of revised EAP approval:	

_____ _____

[Name and Title of Appropriate Manager for Owner] Date

TAB 8

PLAN REVIEW AND UPDATE

This plan will be reviewed and updated annually and table top exercises will be conducted at least once every five years. Document these reviews below.

Date of review: _____ Participants:

Date of review: _____ Participants:

Date of review: _____ Participants:

Date of review: _____ Participants:

Date of tabletop exercise: _____ Participants:

TAB 9
TRAINING RECORD

Use this form to record training sessions. File the completed form in the appropriate Tab of the EAP. All items in the EAP should be thoroughly reviewed during training. Appropriate [Owner] employees and EAP team members should attend a training session annually (or participate in a simulated exercise).

<table>
<tr><td colspan="2">TRAINING LOCATION</td></tr>
<tr><td colspan="2">DATE: TIME: INSTRUCTOR:</td></tr>
<tr><td colspan="2">CLASS SIGN-IN:</td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
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<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td>Type of Simulation Conducted:</td><td>Circle Emergency Type:
Emergency water release
Watch condition
Possible dam failure
Imminent dam failure
Actual dam failure</td></tr>
<tr><td colspan="2">Comments, Results of Exercise:</td></tr>
<tr><td colspan="2">Revisions Needed to EAP Based on Results of Exercise?
☐ Yes ☐ No If yes, list revisions required:</td></tr>
</table>

APPENDIX D

Template for an Emergency Action Plan for an Intermediate or Small Dam

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[NAME] DAM

[TX#####]

EMERGENCY ACTION PLAN

[Date]

Prepared for

[Name]

Prepared by

[Name]

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Emergency Action Plan
[Name] Dam, [TX#####]
[Owner]

Contents

Notification Flowchart (Watch Condition) **65**
Notification Flowchart (Possible, Imminent, or Dam Failure Condition) **66**
EAP Distribution List **67**
Log Sheet of Changes **68**
Approval and Implementation **69**
Emergency Action Plan **70**
1. Purpose 70
2. Dam Description 70
   2.1. General 70
   2.2. Reservoir Operations 70
3. Responsibilities 70
   3.1. Dam Owner's Responsibilities 70
   3.2. Responsibilities for Notification 71
   3.3. Emergency Operations Center 71
   3.4. Responsibilities for Evacuation 71
   3.5. Responsibilities for Duration, Security, Termination, and Follow-up 71
4. Emergency Detection, Evaluation, and Classification 71
   4.1. Emergency Detection 71
   4.2. Emergency Evaluation and Classification 72
   4.3. Previously Known Problems 74
5. Preparedness 74
6. Supplies and Resources 76
7. Inundation Area 76
8. Implementation 77
   8.1. Development 77
   8.2. Updating 77
   8.3. Testing 77
   8.4. Training 78
Tab 1. Vicinity Map **79**
Tab 2. Inundation Map **80**
Tab 3. Dam Description **81**
Tab 4. Sample Public Announcements **82**
Tab 5. Directory of Personnel with Dam Safety Expertise **83**
Tab 6. Supplies and Resources **84**
Tab 7. Annual EAP Evaluation Checklist **85**
Tab 8. Plan Review and Update **86**
Tab 9. Training Record **87**

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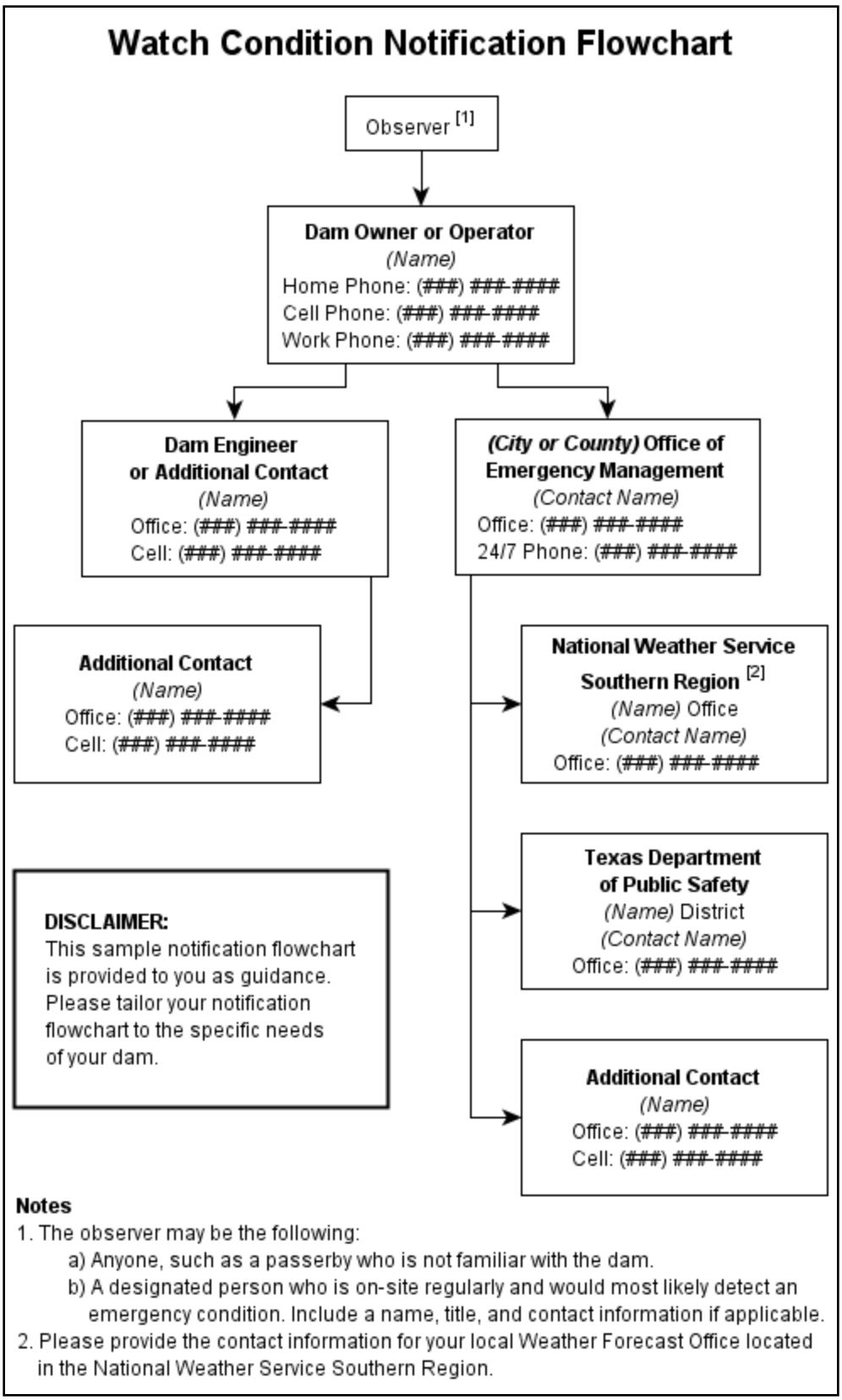
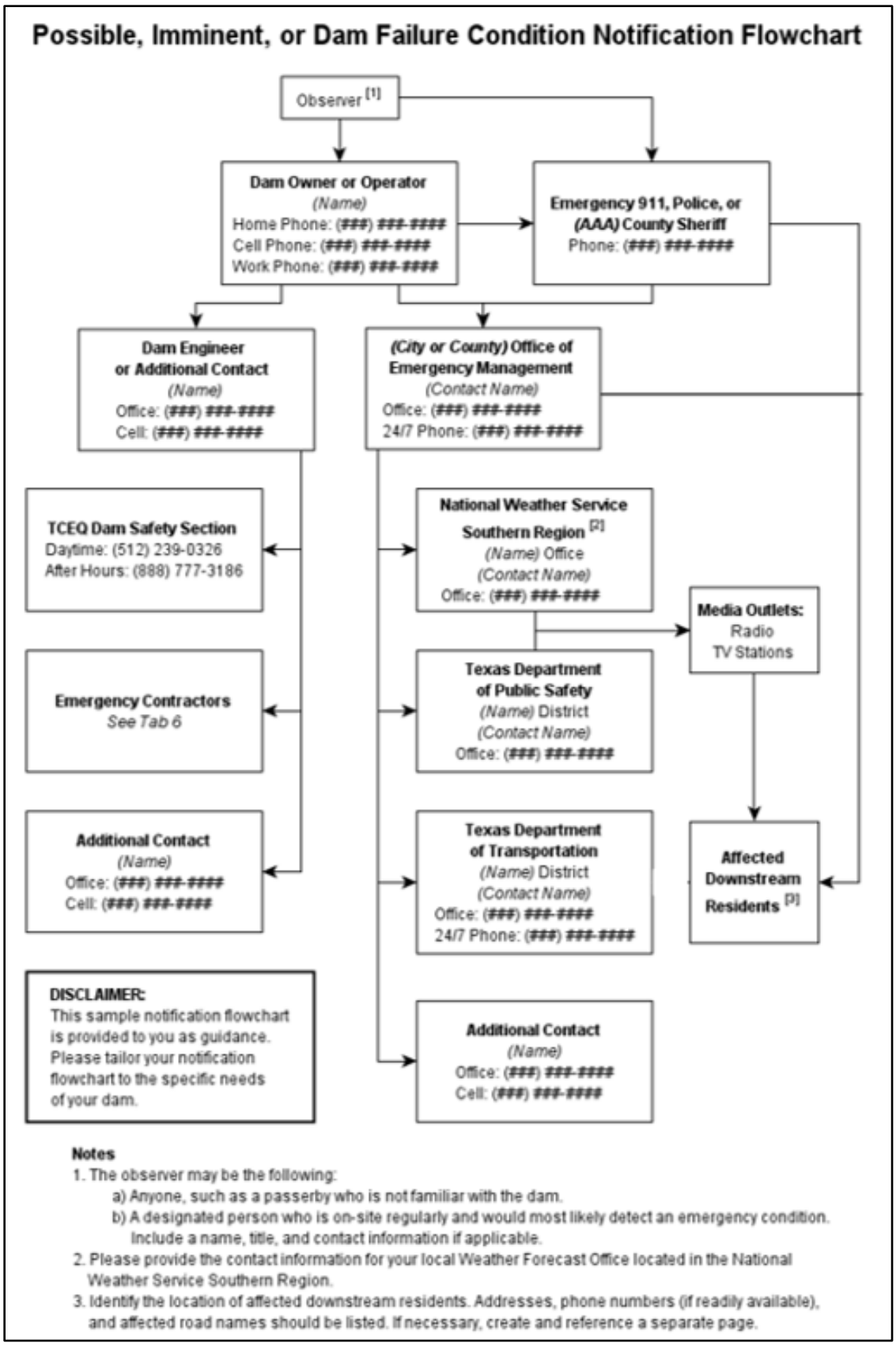


See Appendix G for the text description of the notification flowchart.



See Appendix G for the text description of the notification flowchart.

[NAME] DAM, [TX#####]

EAP DISTRIBUTION LIST

A copy of the EAP has been provided to the following individuals.

Authority	Name, Title, Phone	Address
Owner(s) and Representatives		
Office of Emergency Management [AAA County or AAA City]	Emergency Management Coordinator [Name of Contact] Phone ###-###-####	
Texas Department of Transportation District [###]	[Name of Contact] Phone ###-###-####	
Texas Commission on Environmental Quality	(512) 239-0326 (daytime) (888) 777-3186 (after hours)	Dam Safety Section, MC 177 P.O. Box 13087 Austin, TX 78711
Engineer [Company Name]	[Name of Contact] Phone ###-###-####	

[NAME] DAM, [TX#####]

LOG SHEET OF CHANGES

The following changes have been made to the EAP and revisions have been provided to the individuals shown on the EAP Distribution List.

Date	Change Made	Signature

APPROVAL AND IMPLEMENTATION

EMERGENCY ACTION PLAN

[NAME] DAM, [TX#####]

This Emergency Action Plan is hereby approved. This plan is effective immediately and supersedes all previous editions.

_____ _____

[Name and Title] of Appropriate Manager for Owner Date

I have received a copy of this Emergency Action Plan and concur with the notification procedures.

_____ _____

[Name and Title] of Emergency Management Coordinator Date

EMERGENCY ACTION PLAN

[NAME] DAM, [TX#####]

1. Purpose

The purpose of this Emergency Action Plan (EAP) is to identify emergency situations that could threaten [Name] Dam and to plan for an expedited, effective response to prevent failure of the dam and warn downstream residents of impending danger. This plan defines the notification procedures to be followed in the event of a potentially hazardous situation. The procedures are intended to protect lives and prevent property damage from an uncontrolled release of water from the reservoir.

2. Dam Description

2.1. General

A vicinity map showing the location of the dam can be found in Tab 1. An inundation map illustrating the areas subject to flooding as a result of a dam failure can be found in Tab 2.

[Describe the dam in this section and/or reference the Dam Description in Tab 3].

2.2. Reservoir Operations

[The purpose of this section is to identify features and controls on the dam that would be used to release water and to explain how they would be implemented during an emergency. If the dam does not have any controls, the statement "Releases from the reservoir are uncontrolled" will suffice.]

3. Responsibilities

3.1. Dam Owner's Responsibilities

The owner, [Name], is responsible for all dam operation and maintenance. The EAP will not designate a specific person for each responsibility, but instead will designate the person's title or job description.

The [title] is the first line of dam observers and is the person responsible for initiating implementation of the EAP. The [title] is responsible for conducting routine dam maintenance, such as annual brush control, conducting dam integrity inspections, and notifying [title] of any potential emergency situations. The [title] is responsible for contacting emergency personnel should a dam failure be imminent.

The [title] is also responsible for updating the EAP. An annual EAP review should be conducted to ensure that contact names and numbers are current on the Notification Flowcharts.

The [title] is also responsible for directing specific, incident appropriate actions during an emergency, such as opening or closing water intakes and remedial construction activities such as dirt moving, etc. Specific scenarios are not listed in this EAP.

3.2. Responsibilities for Notification

The [title] is responsible for inspecting the dam in a potential emergency such as the potential threat of high waters or a tornado. The [title] will contact the [AAA County Sheriff or AAA City Police] and emergency management coordinator.

If warranted, the [title] will notify the TCEQ Dam Safety Section. The [AAA County Sheriff or AAA City Police] will notify downstream residents. The [AAA County or AAA City] emergency management coordinator will implement the Notification Flowchart for regional and state emergency management contacts and contact the proper media outlets. Sample public announcements appear in Tab 4.

3.3. Emergency Operations Center

In the event of a "possible dam failure" or more serious condition, the [title of emergency management coordinator] will activate the Emergency Operations Center to serve as the main distribution center for warning and evacuation activities. The Emergency Operations Center will be established at the [location of office]. The [title of emergency management coordinator] will be responsible for initiating actions from this location.

[For small-size dams or intermediate-size dams that do not require local agencies to activate an Emergency Operations Center; omit the paragraph above. Instead, use this section to designate a safe and accessible area near the dam where the owner and emergency officials can gather to monitor the emergency event and direct emergency actions.]

3.4. Responsibilities for Evacuation

The [AAA County Sheriff or AAA City Police] is responsible for initiating evacuations.

3.5. Responsibilities for Duration, Security, Termination, and Follow-up

The [title] is responsible for monitoring of emergency situations at the dam and keeping authorities informed, based on the Notification Flowcharts.

The [title] and the [title of emergency management coordinator] are responsible for declaring that an emergency at the dam is terminated. Applicable authorities will be notified based on the Notification Flowcharts.

The [title] will ensure that a follow-up evaluation is completed by all participants after the emergency. The results of the evaluation should be documented in a written report and filed with the EAP.

4. Emergency Detection, Evaluation, and Classification

4.1. Emergency Detection

A. Situations

Many dam conditions can lead to emergency situations, not all of which will necessitate the implementation of the EAP. However, if any of them occur, the appropriate actions will be taken.

- **Severe Storms/Inclement Weather:** Although generally not in themselves a threat to the dam, severe storms and other inclement weather conditions can contribute to an existing problem and hinder any remediation efforts. Severe storms also cause the uncontrolled release of floodwater, and increase flow in already rain-swollen areas.
- **Tornadoes:** Tornadoes do occur in the area, with the potential for structural damage to the dam, possibly resulting in its failure. If a tornado has struck in the area, an inspection of the dam for any signs of damage will be appropriate.
- **Earthquakes:** [Dam Name] is located in a seismic zone with low activity. An earthquake is, however, a possibility, and appropriate post-earthquake inspections should be performed.
- **Sabotage:** A threat to damage the dam has been made. Appropriate actions will be taken to protect the dam.

B. Signs of Failure

The [title] is responsible for conducting routine inspections and identifying conditions that could indicate the onset of problems leading to a dam failure. The early identification of potentially dangerous conditions can allow time for the implementation of the EAP. It is important to understand how distress can develop into failure. With appropriate action, distress need not lead to a catastrophic failure of the dam. The following sections describe some of the different types of failure which could lead to a dam failure.

- **Seepage Failure:** Although all earthen embankments allow some minor seepage through the dam or the foundation, excessive, uncontrolled seepage can result in piping (or the movement of embankment material in the seepage flow) and lead to failure. Piping can occur for years at a slow rate. If the piping has progressed to a dangerous level, it will be evident by increased flow or the discharge of muddy water (or both). At that stage, immediate action to stop the piping is needed. Fully developed piping is difficult to control and is very likely to result in failure. A whirlpool in the reservoir is a sign of uncontrollable piping and necessitates immediate emergency action.
- **Embankment or Foundation Sliding:** Sliding is usually first apparent when cracks or bulges in the embankment appear. Slides with progressive movement can cause failure of the embankment.
- **Structural Failure:** The structural failure or collapse of any portion of the principal spillway or spillway gates could result in loss of the reservoir. A structural failure of a portion of the spillway could cause piping and possibly embankment failure.
- **Overtopping Failure:** Overtopping of the embankment results in erosion of the dam crest. Once erosion begins, it is very difficult to stop.

4.2. Emergency Evaluation and Classification

This section lists the conditions and actions which may be used to classify the level of emergency response, as a guide for the [Owner].

- **Watch Condition:** A problem has been detected at the dam which requires constant monitoring or immediate action to repair or correct. At this time, the distress condition is manageable by dam personnel.

  The [Owner] will be responsible for monitoring and repair as soon as possible and implementing the appropriate Notification Flowchart. The following is a list of conditions which constitute "watch" conditions:

  - cloudy or dirty seepage or seepage with an increase in flow, boils, piping, or bogs
  - seepage around conduits
  - large sinkholes with corresponding seepage anywhere on the embankment or downstream from the toe
  - any slide that degrades the crest of the embankment or that is progressively increasing in size
  - cracking or movement of any concrete structure
  - the engagement of the emergency spillway

- **Possible Dam Failure Condition:** A "watch" condition that is progressively getting worse. A situation is developing that could cause the dam to fail. Efforts to correct the situation will continue. There is no immediate danger; however, if conditions continue to deteriorate, the dam could fail.

  The [Owner] will be responsible for initiating immediate repairs, including lowering the reservoir if appropriate and implementing the appropriate Notification Flowchart. The following is a list of conditions which constitute "possible dam failure" conditions:

  - large boils, increasing in size and flow rate, especially if there is flowing muddy water
  - significantly increasing seepage, especially flowing muddy water
  - slides involving a large mass of material that impairs the crest of the dam and is continuing to move
  - sinkholes with seepage flowing muddy water
  - large cracks, movement or failure of a portion of any major concrete structure that forms an integral part of the dam
  - an increase in the reservoir level to near the top of the dam
  - overtopping of a dam that is not designed for overtopping

- **Imminent Dam Failure/Dam Failure Condition:** The [Owner] has determined that a dam failure is occurring or has already occurred and will result in flooding that threatens life and property. No time remains to implement measures to prevent failure. Evacuation has begun and will continue until the situation is stabilized.

  The [Owner] is responsible for implementing the appropriate Notification Flowchart. The following is a list of conditions which constitute "imminent dam failure" or "dam failure" conditions:

  - rapidly increasing boils or the presence of new, significantly flowing boils, particularly muddy ones near previously identified ones
  - rapidly increasing seepage, especially flowing muddy water

- slides involving a large mass of material or which have degraded the crest of the embankment to a level that approaches the water surface level, or if significant seepage is observed through the slide area
- settlement that is predicted to degrade to the reservoir level
- cracks that extend to the reservoir level
- significant movement or failure of any structure that forms an integral part of the dam
- overtopping of an earthen dam
- uncontrollable release of the reservoir

4.3. Previously Known Problems

[Identify any known problems with the dam such as those outlined in previous dam safety inspections.]

5. Preparedness

Preparedness actions are to be taken both before and following the development of emergency conditions and should identify ways of preparing for an emergency, increasing response readiness in a uniform and coordinated manner, and helping to reduce the effects of a dam failure. The following are some steps that could prevent or delay failure after an emergency is first discovered.

- **Surveillance:** [title] will monitor the dam during emergency situations such as a severe storm event.
- **Response during weekends and holidays:** [title] will be available for emergency response during weekends and holidays and can be present at the dam site within [# minutes] of detection of an emergency condition.
- **Response during periods of darkness and adverse weather:** [title] will arrange for access to generators and lights to adequately monitor the situation. [title] will be able to access the site during adverse weather conditions by [method of access - i.e. foot, utility vehicle, etc.].
- **Access to the site:** Alternate access routes should be planned in the event of an emergency at the dam. [Example: The road across the dam is a gravel roadway with grass edges which should allow discharge across the road rendering this route inaccessible. The north and east alternate routes should be used instead under such conditions. All-weather access to the downstream toe of the dam will also be unavailable. For developing situations near the downstream toe of the dam, gravel may need to be brought in to stabilize a road in that area.]

The following actions should only be undertaken under the direction of a professional engineer or contractor. In all cases, the appropriate Notification Flowchart must be implemented and the personnel of the TCEQ Dam Safety Section must be notified.

Local professionals with dam experience should be contacted as needed. A Directory of Personnel with Dam Safety Expertise can be found in Tab 5.

Consider the following preparedness actions if the dam's integrity is threatened by:

Overtopping by flood waters:

(a) Give erosion-resistant protection to the downstream slope by placing plastic sheets or other materials over eroding areas.

(b) Divert floodwaters around the reservoir basin, if possible.

A slide on the upstream or downstream slope of the embankment:

(a) Lower the water level in the reservoir at a rate, and to an elevation, considered safe given the slide condition. If the outlet is damaged or blocked, pumping or siphoning may be required.

(b) Stabilize any slide on the downstream slope by weighting the toe area below the slide with additional soil, rock, or gravel.

Erosional seepage or leakage (piping) through the embankment, foundation, or abutments

(a) Plug the flow with whatever material is available (hay bales, bentonite, or plastic sheeting, if the entrance to the leak is in the reservoir).

(b) Lower the water level in the reservoir until the flow decreases to a non-erosive velocity or until it stops.

(c) Place an inverted filter (a protective sand and gravel filter) over the exit area to hold materials in place.

(d) Continue lowering the water level until a safe elevation is reached; continue operating at a reduced level until repairs are made.

A failure of an appurtenant structure such as an inlet or outlet of the spillway

(a) Implement temporary measures to protect the damaged structure, such as closing the inlet or putting in place temporary protection for a damaged spillway.

(b) Employ experienced, professional divers, if necessary, to assess the problem and possibly implement repair.

(c) Lower the water level in the reservoir to a safe elevation. If the inlet is inoperable, pumping or siphoning may be required.

A mass movement of the dam on its foundation (spreading or mass sliding failure)

(a) Immediately lower the water level until excessive movement stops.

(b) Continue lowering the water level until a safe level is reached; continue operation at a reduced level until repairs are made.

Auxiliary spillway erosion threatening reservoir evacuation

(a) Provide temporary protection at the point of erosion by putting in place sandbags, riprap materials, or plastic sheets weighted with sandbags.

(b) Consider pumps and siphons to help reduce the water level in the reservoir.

(c) When inflow subsides, lower the water in the reservoir to a safe level; continue operating at a lower water level in order to minimize spillway flow.

Excessive settlement of the embankment

(a) Lower the water level by releasing it through the outlet or by pumping or siphoning.

(b) If necessary, restore freeboard, preferably using sandbags.

(c) Lower the water in the reservoir to a safe level; continue operating at a reduced level until repairs can be made.

Malicious human activity (sabotage, vandalism, or terrorism)

(a) If malicious human activity that could endanger public safety is suspected, contact law enforcement personnel for their help in evaluating the situation.

(b) If the embankment or a spillway has been damaged or partially removed, provide temporary protection in the damaged area by putting in place sandbags, riprap materials, or plastic sheets weighted with sandbags. Use pumps and siphons to help reduce the water level in the reservoir.

(c) If the water supply has been contaminated, immediately close all inlets to the water supply system and notify appropriate authorities.

6. Supplies and Resources

In an emergency, equipment, supplies, and other resources may be needed on short notice, such as sandbags, riprap, fill materials, and heavy equipment. Resources that may be helpful include:

- earth-moving equipment
- riprap
- sand and gravel
- sandbags
- pumps
- pipe
- laborers
- lighting equipment
- back-up generators

A list of local contractors who can provide equipment during an emergency can be found in Tab 6.

7. Inundation Area

A dam failure could potentially affect [road name] and [2 houses - 123 Beaver Lake Road and 246 Beaver Lake Road]. Refer to Tab 2 for the Inundation Map which shows the area that could be inundated by a breach in the dam. Refer to Tab 4 for public announcements (notification messages) for various watch/failure conditions.

[Some small-size and most intermediate-size dams require a dam breach analysis performed by a professional engineer. Breach analysis results are used to determine potentially inundated areas for a dam and to prepare an inundation map used by emergency personnel for evacuation planning. The

requirement for a breach analysis is determined on a case-by-case basis. For small dams with very limited downstream development, a breach analysis is usually not required. Dams with a substantial number of structures downstream or complex floodplains may require a simplified or full breach analysis. Dam owners who are unsure of whether or not their dam requires a breach analysis should contact the TCEQ Dam Safety Section.]

[If a Breach Analysis was prepared by a professional engineer, include a paragraph summarizing the results and referencing the report, as shown in the sample below. Otherwise, omit the following:]

> The Inundation Map was prepared using the results of the breach analysis. After examining the results of the breach analysis of [Name] Dam, it has been determined that there were a significant number of structures that could be affected by a dam breach. These structures are located along the [Stream], the [Stream], and the [Stream]. [City or Town] can suffer a dramatic impact from a breach in the dam. In addition, water resulting from a breach, and associated damages, will travel up the [Stream].
>
> Figures in the breach analysis include information on the estimated impact of flooding on the bridges along the [Stream], the [Stream], and the [Stream].

8. Implementation

8.1. Development

The draft EAP was sent to the TCEQ for review, and agency comments were incorporated into this document, a copy of which is currently on file with TCEQ.

8.2. Updating

Copies of the EAP have been provided to the appropriate individuals and the EAP has been approved and signed by the owner and emergency management coordinator, as shown on the Distribution List and Approval and Implementation sheets at the front of the report. This plan will be reviewed and updated annually by [Owner] and personnel from local emergency management agencies in conjunction with [Owner] annual maintenance inspection of the dam. The [Owner] will review and complete all items on the Annual EAP Evaluation Checklist in Tab 7. After the annual update is complete, a new Approval and Implementation sheet will be attached and the annual update will be documented on the Plan Review and Update sheet in Tab 8.

If revisions to the EAP are made as a result of the annual update, such changes will be recorded on the Log Sheet of Changes form at the front of the report. A copy of the updated portions of the EAP will be sent to TCEQ and all individuals listed on the Distribution List. If the EAP was reviewed and revisions were not required, the [Owner] will submit written notification to the TCEQ that no updates to the EAP have been adopted or implemented.

8.3. Testing

A table top exercise will be conducted at least once every five years. The table top exercise involves a meeting of [Owner] with local and state emergency management officials in a conference room. The exercise begins with a description of a simulated event and proceeds with discussions by the participants to evaluate the EAP and response procedures, and to resolve concerns regarding coordination and responsibilities. Any problems identified during an exercise should be included in

revisions to the EAP. The table top exercise will be documented on the Plan Review and Update sheet in Tab 8. Records of table top exercises will be resolved and maintained in Tab 9.

8.4. Training

All people involved in the EAP will be trained to ensure that they are thoroughly familiar with its elements, the availability of equipment, and their responsibilities and duties under the plan. Personnel will be trained in problem detection, evaluation, and appropriate corrective measures. This training is essential for proper evaluation of developing situations at all levels of responsibility. Training records will be maintained in Tab 9.

TAB 1
VICINITY MAP

The purpose of the vicinity map is to show the location of the dam and surrounding roads that provide access to the dam. USGS topographic maps, county road maps, city street maps, or free internet mapping applications such as Google Maps, Bing, Yahoo, or Map Quest can be used to produce the vicinity map. An example is shown below.

The vicinity map must include the following features:

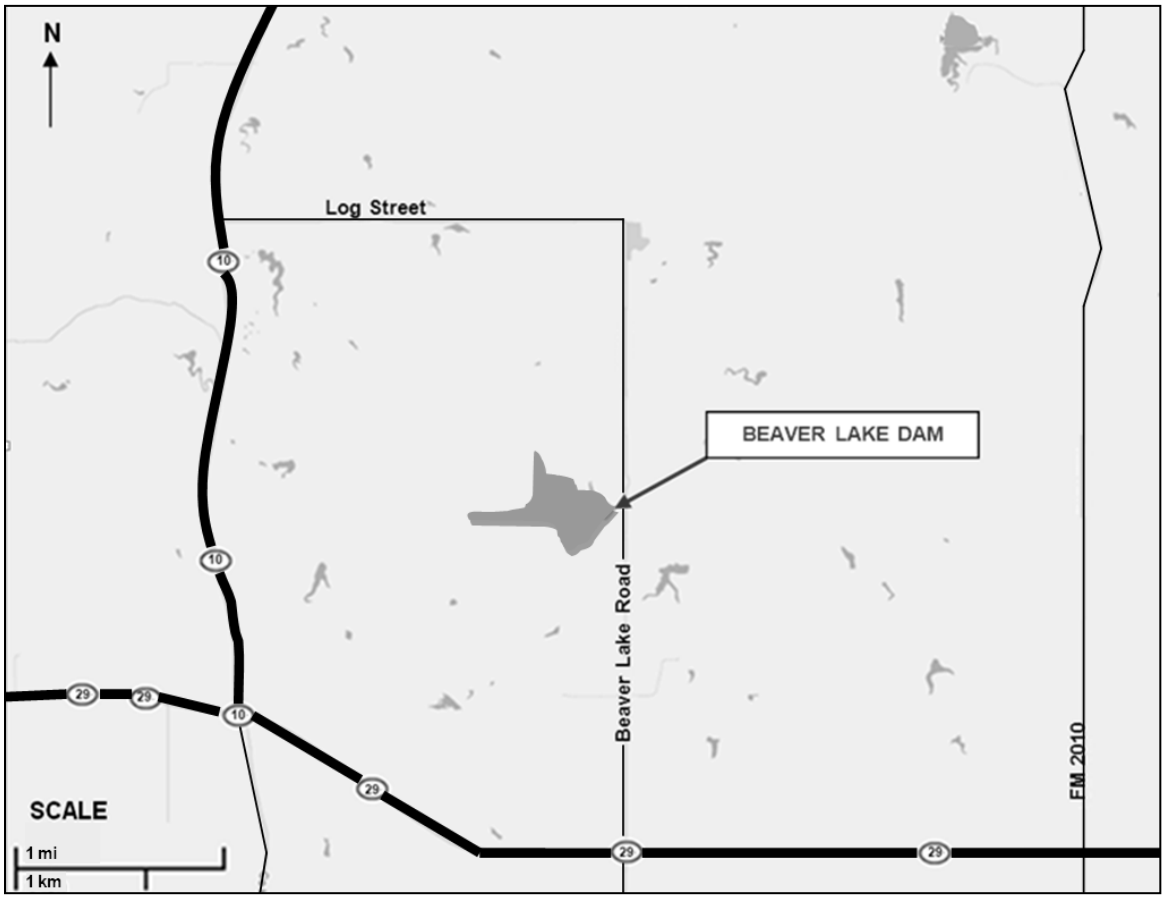
a. Show the location of the dam in relation to major roads (highways, farm to market, county roads, etc.), intersections, and landmarks in the area.

b. Label all applicable street names.

c. Label the dam.

d. Include a north arrow.

e. Scale the map appropriately to ensure all applicable features are visible. Include a scale bar.



Example - Vicinity Map

TAB 2
INUNDATION MAP

An inundation map is used to depict areas that could potentially flood if a dam fails. The inundation map should be used for evacuation planning. **All dams require an inundation map**, but the level of detail required on the map depends on the size of the dam and complexity of the floodplain conditions. Use the best available maps, including USGS topographic maps, county road maps, city street maps or maps from free internet mapping applications such as Google Maps, Bing, Yahoo, or Map Quest. At a minimum, the exhibit should include the features of one of the following types of inundation maps:

1. Generalized Inundation Map (for dams with limited downstream development):
   a. Label the dam.
   b. Label all applicable street names.
   c. Label all applicable river/stream names.
   d. Include a north arrow.
   e. Scale the map appropriately to ensure all applicable features are visible. Include a scale bar.
   f. Use USGS topographic maps or aerial photography to show the affected areas of development.
   g. Label the potential hazards that could be affected by a dam failure.
      - Call out affected roads and low-water crossings.
      - Label potentially affected structures with street addresses.
2. Detailed Inundation Map (For dams with significant numbers of structures downstream or complex floodplains. Typically prepared using the results of a breach analysis performed by a professional engineer):

   Include items a-g from the "Generalized Inundation Map" section above.

   a. If the inundation area includes dense development, individual labels for affected structures are not required. Label developed areas, critical structures, and major roads as needed. (i.e. subdivision names, schools, hospitals, highways)
   b. Clearly delineate the boundary of the breach inundation area. Do not show any non-breach runs on the inundation map that is included with the EAP. For a full breach analysis, only show sunny day and design breach runs.
   c. If applicable, label the time to flood (time from the breach to the time critical structures and roads are flooded).
   d. If applicable, label the time to peak flow.
   e. Include a note that states "Because of the method, procedures, and assumptions used to determine the flooded areas; the limits of flooding shown and flood-wave travel times are approximate and should be used only as a guideline for establishing evacuation zones. Areas inundated in an actual event will depend on actual failure conditions and may differ from areas shown on the maps."

TAB 3
DAM DESCRIPTION

Official Dam Name (1): _____

Stream: _____

Dam Location: _____

Latitude/Longitude: _____

Dam Owner: _____ Phone Number: _____

Dam Owner's Address: _____

Embankment

Type	_____ (ex.–earthen embankment)
Year Constructed	_____
Length	_____ feet
Maximum Height	_____ feet
Top Width	_____ feet
Top of Embankment Elevation	_____ feet-msl
Drainage Area	_____ square miles

Principal Spillway (2)

Type	_____ (ex.–Uncontrolled ogee weir)
Location	_____ (ex. - Right abutment)
Crest Length	_____ feet
Crest Elevation	_____ feet-msl

Emergency Spillway

Type	_____ (ex.–Excavated, broad-crested weir)
Location	_____ (ex.–Left abutment)
Crest Length	_____ feet
Crest Elevation	_____ feet-msl

Inlet-Outlet Works

Type	_____
Location	_____ (ex.–Right end of the dam)
Invert Elevation (Inlet)	_____ feet-msl (bottom of pipe)
Invert Elevation (Outlet)	_____ feet-msl (bottom of pipe)

Reservoir

Elev. Top of Conservation Pool	_____ feet-msl
Capacity Conservation Pool (Normal Pool)	_____ acre-feet
Capacity at Top of Dam (Maximum)	_____ acre-feet
Surface Area	_____ acres

(1) If the dam is known by more than one name, it is recommended that all names be listed (i.e. Official TCEQ name, City name, common name known by locals, etc.)

(2) If the dam has multiple spillways, create additional subsections as necessary to include information on all spillways.

TAB 4

SAMPLE PUBLIC ANNOUNCEMENTS

Note: These messages are communicated to downstream residents to alert the public of impending danger. The [Owner] should coordinate with the National Weather Service, the Department of Public Safety [Location] District Coordinator office, and the Emergency Management Coordinators for [AAA, BBB, and CCC county] prior to release. Messages developed with the assistance of the National Weather Service may be used instead, which can be communicated via radio, television, and other media outlets.

Announcement for a Slowly Developing "Watch" Condition

[Owner] has declared a "Watch" condition for [Name] Dam, Texas ID [TX#####] as of [time and date]. [Briefly describe the problem or condition.] There is no immediate danger of the dam failing; however the potential does exist. [Describe what actions are being taken to monitor and control the situation.] [State the quantity of any releases from the reservoir.]

Announcement for a Possible Dam Failure

This is an emergency message. [Owner] has declared a possible dam failure at [Name] Dam, Texas ID [TX#####] as of [time and date]. [Briefly describe the problem or condition.] It is possible the dam could fail. Attempts to save the dam are under way, but their success cannot be determined as yet. [Describe what actions are being taken to monitor and control the situation.] [State the quantity of any releases from the reservoir.] Additional news will be made available as soon as it is received.

Announcement for an Imminent Dam Failure

Urgent! This is an emergency message. [Owner] has announced that [Name] Dam, Texas ID [TX#####] is in imminent danger of failing. [Describe what actions are being taken to monitor and control the situation.] It is possible that the dam will fail in [##] hours. Residents in low lying areas along the [Stream], the [Stream], and the [Stream], as well as the town of [Name], should prepare for immediate evacuation. Additional news will be made available as soon as it is received.

Announcement of a Dam Failure

Emergency! This is an emergency message. [Name] Dam, Texas ID [TX#####] failed at [time and date]. Residents who have not yet done so should immediately evacuate the city of [Name] and low-lying areas along the [Stream], the [Stream], and the [Stream]. The flood waters have already reached [Highway] and [Road]. Additional news will be made available as soon as it is received.

TAB 5
DIRECTORY OF PERSONNEL WITH DAM SAFETY EXPERTISE

The following list identifies additional individuals with expertise in dam safety, design and construction, such as local engineers, contractors, and authorities that may be consulted about taking specific actions at the dam when there is an emergency situation. The TCEQ Dam Safety Section is not included in this section. TCEQ Dam Safety should be contacted during an emergency and can provide technical assistance by phone, but not immediate on-site assistance. TCEQ is not responsible for emergency evacuation.

NAME	TELEPHONE	RESPONSIBILITY

TAB 6
SUPPLIES AND RESOURCES

The following equipment and supplies may be necessary for use during a dam emergency. Contact information for local contractors who can provide the following items during an emergency is listed below. For supplies owned by the dam owner, the dam owner's name and the specific location of the supplies have been denoted.

EQUIPMENT/SUPPLIES	LOCATION
Backhoes Dump trucks Portable welding equipment Generators Bulldozers Excavators Loaders Motor graders	[Names, addresses, and phone numbers of contractors]
Crane	[Names, addresses, and phone numbers of contractors]
Sandbags	[Names, addresses, and phone numbers of suppliers]
Rock riprap	[Names, addresses, and phone numbers of suppliers]
Fill Material	[Names, addresses, and phone numbers of suppliers]
Other - _____	[Names, addresses, and phone numbers of suppliers]

TAB 7

ANNUAL EAP EVALUATION CHECKLIST

Was the annual dam inspection conducted?	□ Yes □ No	If yes, has the EAP been revised to include any signs of failures observed during the inspection?	□ Yes □ No
Was brush clearing, animal burrow removal, or other maintenance required?	□ Yes □ No	If yes, describe actions taken and date:	
Was the outlet gate operable?	□ Yes □ No	If no, describe actions taken and date:	
Do the Notification Flowcharts require revision? (Note that revision of the contact information will not require EAP approval; however, the revised contact information pages will need to be redistributed as a replacement pages.)	□ Yes □ No	If yes, list the dates of the contact information revision and redistribution:	
Was annual training or an exercise conducted?	□ Yes □ No	Circle: **training exercise** Date conducted:	
Are inspection and training records included in the EAP?	□ Yes □ No		
Was the EAP reviewed?	□ Yes □ No	If yes, review date:	
Were changes required to the EAP?	□ Yes □ No	If yes, date of revised EAP approval:	

_____ _____

[Name and Title of Appropriate Manager for Owner] Date

TAB 8

PLAN REVIEW AND UPDATE

This plan will be reviewed and updated annually and table top exercises will be conducted at least once every five years. Document these reviews below.

Date of review: _____ Participants:

Date of review: _____ Participants:

Date of review: _____ Participants:

Date of review: _____ Participants:

Date of table top exercise: _____ Participants:

TAB 9
TRAINING RECORD

Use this form to record training sessions. File the completed form in the appropriate Tab of the EAP. All items in the EAP should be thoroughly reviewed during training. Appropriate [Owner] employees and EAP team members should attend a training session annually (or participate in a simulated exercise).

<table>
<tr><td colspan="2">TRAINING LOCATION:</td></tr>
<tr><td colspan="2">DATE: TIME: INSTRUCTOR:</td></tr>
<tr><td colspan="2">CLASS SIGN-IN:</td></tr>
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<tr><td></td><td></td></tr>
<tr><td>Type of Simulation Conducted:</td><td>Circle Emergency Type:
Emergency water release
Watch condition
Possible dam failure
Imminent dam failure
Actual dam failure</td></tr>
<tr><td colspan="2">Comments, Results of Exercise:</td></tr>
<tr><td colspan="2">Revisions Needed to EAP Based on Results of Exercise?
☐ Yes ☐ No If yes, list revisions required:</td></tr>
</table>

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APPENDIX E

National Weather Service Map

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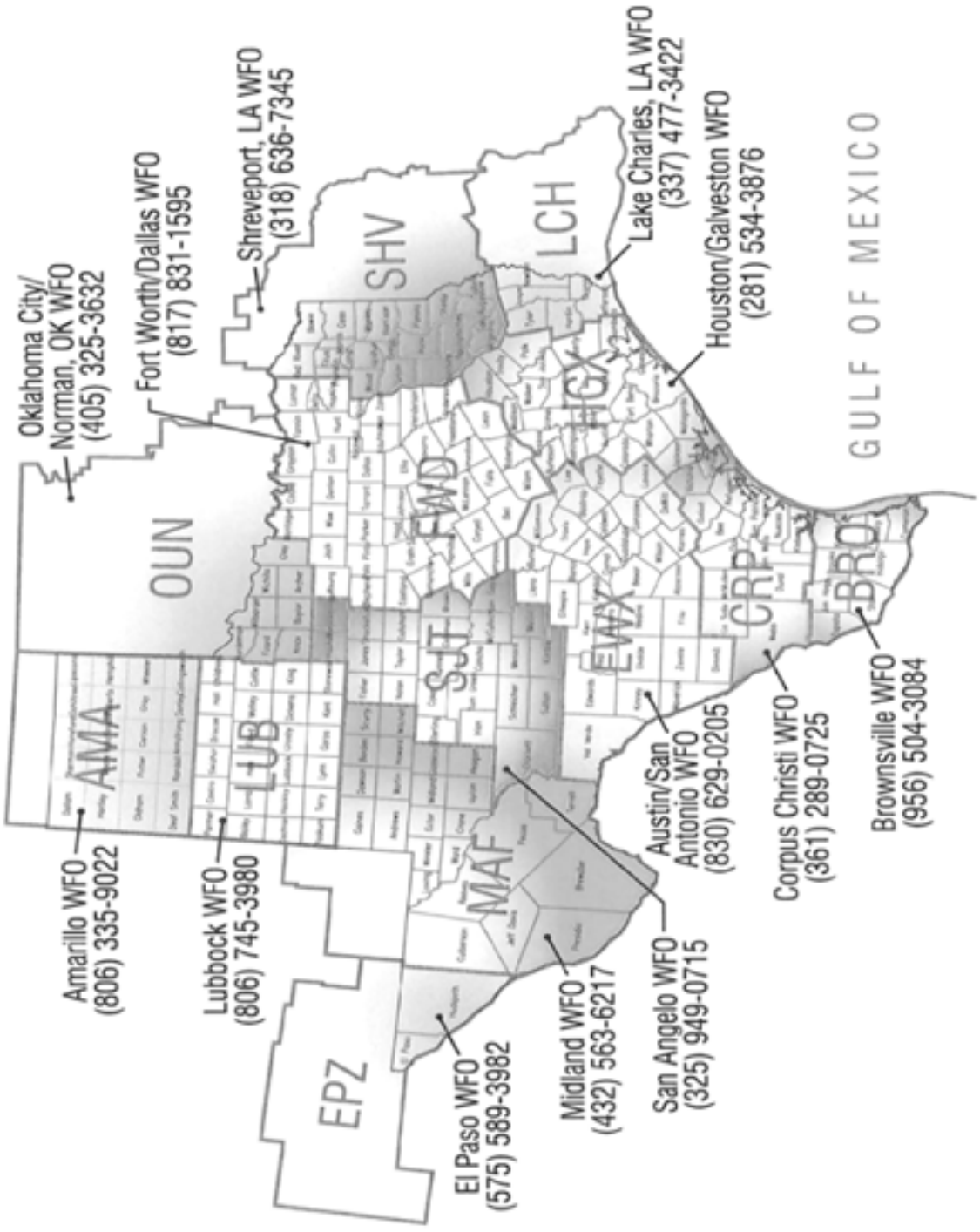
NATIONAL WEATHER SERVICE MAP



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APPENDIX F

Glossary

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GLOSSARY

Abutment – The part of the valley side against which the dam is constructed. The left and right abutments of a dam are defined with the observer looking downstream from the dam.

Acre-foot – A unit of volume equivalent to one acre of surface area to a depth of one foot. One acre-foot is equal to 325,851 gallons or 43,560 cubic feet.

Appurtenant structures – The outlet works and controls, spillways and control gates, valves, siphons, access structures, bridges, berms, drains, hydroelectric facilities, instrumentation, and other structures related to the operation of the dam.

Boil – A disruption of the soil surface due to water discharging from below the surface. Eroded soil may be deposited in the form of a ring (miniature volcano) around the disruption.

Breach – An excavation or opening, either controlled or a result of a failure of the dam, through a dam or spillway that is capable of completely draining the reservoir down to the approximate original topography so the dam will no longer impound water, or partially draining the reservoir to lower impounding capacity.

Breach analysis – The determination of the most likely uncontrolled release of water from a dam (magnitude, duration, and location), using accepted engineering practice, to evaluate downstream hazard potential.

Breach inundation area – An area that would be flooded as a result of a dam failure.

Construction – Building a proposed dam and appurtenant structures capable of storing water.

Dam – Any barrier or barriers, with any appurtenant structures, constructed for the purpose of either permanently or temporarily impounding water.

Dam failure – A breach and uncontrolled release of the reservoir.

Design flood – The flood used in the design and evaluation of a dam and appurtenant structures, partially for determining the size of spillways, outlet works, and the effective crest of the dam.

Detailed inundation map – A type of inundation map that is prepared by a professional engineer using the results of a breach analysis. This map should include sufficient detail to identify areas likely to be affected, topography, the boundary of the breach inundation area, and labeled hazards. For full breach-analysis studies, this map should include time to flood and time to peak flow.

Effective crest of the dam – The elevation of the lowest point on the crest (top) of the dam, excluding spillways.

Emergency action plan (EAP) – A written document prepared by the owner or the owner's professional engineer describing a detailed plan to prevent or lessen the effects of a failure of the dam or appurtenant structures.

Emergency repairs – Any repairs, considered to be temporary in nature, and that are necessary to preserve the integrity of the dam and prevent a possible failure of the dam.

Emergency spillway – An auxiliary spillway designed to pass a large, but infrequent, volume of flood flow, with a crest elevation higher than the principal spillway or normal operating level.

Existing dam – Any dam under construction or completed as of the effective date of Title 30 of the Texas Administrative Code, Chapter 299: "Dams and Reservoirs."

Generalized inundation map – A type of inundation map, which does not need to be prepared by a professional engineer, that should include sufficient detail to identify areas likely to be affected by a particular flood event or a dam failure.

Hazard classification – A measure of the potential for loss of life, property damage, or economic impact in the area downstream of the dam in the event of a failure or malfunction of the dam or appurtenant structures. The hazard classification does not represent the physical condition of the dam.

Height of dam – The difference in elevation between the natural bed of the watercourse or the lowest point on the downstream toe of the dam, whichever is lower, and the effective crest of the dam.

Intermediate-size dam – A dam that has a height equal to or greater than 40 feet and less than 100 feet or has a capacity equal to or greater than 1,000 acre-feet but less than 50,000 acre-feet.

Inundation map – A map delineating the area that would be flooded by a particular flood event or a dam failure.

Large-size dam – A dam that has a height equal to or greater than 100 feet or has a maximum capacity equal to or greater than 50,000 acre-feet.

Loss of life – Human fatalities that would result from a failure of the dam, without considering the mitigation of loss of life that could occur with evacuation or other emergency actions.

Maintenance – Those tasks that are generally recurring and are necessary to keep the dam and appurtenant structures in a sound condition and free from defect or damage that could hinder the dam's functions as designed, including adjacent areas that also could affect the function and operation of the dam.

Maintenance inspection – Visual inspection of the dam and appurtenant structures by the owner or owner's representative to detect apparent signs of deterioration, other deficiencies, or any other areas of concern.

Maximum storage capacity – The volume, in acre-feet, of the impoundment created by the dam at the effective crest of the dam; only water that can be stored above natural ground level or that could be released by failure of the dam is considered in assessing the storage volume; the maximum storage capacity may decrease over time due to sedimentation or increase if the reservoir is dredged.

Normal storage capacity – The volume, in acre-feet, of the impoundment created by the dam at the lowest uncontrolled spillway crest elevation, or at the maximum elevation of the reservoir at the normal (non-flooding) operating level.

Outlet – A conduit or pipe controlled by a gate or valve, or a siphon, that is used to release impounded water from the reservoir.

Piping – The progressive removal of soil particles from a dam by percolating water, leading to development of channels or flow paths.

Principal spillway – The primary or initial spillway engaged during a rainfall runoff event that is designed to pass normal flows.

Probable maximum flood (PMF) – The flood magnitude that may be expected from the most critical combination of meteorologic and hydrologic conditions that are reasonably possible for a given watershed.

Professional engineer – An individual licensed by the Texas Board of Professional Engineers to engage in the practice of engineering in the state of Texas, with experience in the investigation, design, construction, repair, and maintenance of dams.

Proposed dam – Any dam not yet under construction.

Repairs – Any work done on a dam that may affect the integrity, safety, and operation of the dam.

Reservoir – A body of water impounded by a dam.

Riprap – A layer of large rock, precast blocks, bags of cement, or other suitable material, generally placed on an embankment or along a watercourse as protection against wave action, erosion, or scour.

Safe manner – Operating and maintaining a dam in sound condition, free from defect or damage that could hinder the dam's functions as designed.

Seepage – The percolation of water downwards and/or laterally through the embankment, foundation, or abutments of a dam, often emerging at ground level lower down the slope.

Slide – The movement of a mass of earth down a slope on the embankment or abutment of a dam.

Small-size dam – A dam that has a height equal to or greater than 25 feet and less than 40 feet with a maximum capacity equal to or greater than 15 acre-feet and less than 1,000 acre-feet or a height greater than 6 feet and less than 40 feet with a maximum capacity equal to or greater than 50 acre-feet and less than 1,000 acre-feet.

Spillway – An appurtenant structure that conducts outflow from a reservoir.

Toe of dam – The junction of the upstream or downstream slope of an embankment with the natural grade (ground surface).

Vicinity map – A map that shows the location of the dam and surrounding roads that provide access to the dam. This map should display the location of the dam in relation to major roads and streets, and should include a north arrow and scale bar.

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APPENDIX G

Text Descriptions of Notification Flowcharts

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HB26 GATE OPERATIONS NOTIFICATION FLOWCHART

This page summarizes the flowchart depicted on page 26.

Disclaimer: This sample notification flowchart is provided to you as guidance; please tailor your flowchart to the specific needs of your dam. Include contacts' names, titles, and phone numbers (office, cell, and 24-hour) for all sections mentioned below, if applicable.

The process starts with the dam owner or operator (or representative) who is responsible for notifying the following agencies or organizations:

- The National Weather Service's River Forecast Center.
- TCEQ's Dam Safety Program (Include the following phone numbers in this section: Daytime: 512-239-0326 and 24-hour: 888-777-3186).
- Local emergency managers.

The local emergency managers are responsible for informing the residents and businesses that are or could be affected downstream due to the gate operation.

- The affected downstream residents, their location, addresses, phone numbers (if readily available), and the affected road names should be listed. If necessary, create and reference a separate page.

WATCH CONDITION NOTIFICATION FLOWCHART FOR A LARGE DAM

This page summarizes the flowchart on page 33.

Disclaimer: This sample notification flowchart is provided to you as guidance; please tailor your flowchart to the specific needs of your dam. Include contacts' names, titles, and phone numbers (office, cell, and 24-hour) for all sections mentioned below, if applicable.

Include in this section the dam owner's name, and dam facility staff names and numbers (if applicable) such as: owner's emergency planning manager, shift manager, and backup coordinator.

The dam owner or staff is responsible for notifying the following agencies or organizations:

- The dam engineer or additional contacts.
- The department manager or equivalent.
- (City or County) Office of Emergency Management. Include contact information for all potentially impacted districts and area offices.

The dam engineer or the additional contact is responsible for notifying the following:

- TCEQ's Dam Safety Program (Include the following phone numbers in this section: Daytime: 512-239-0326 and 24-hour: 888-777-3186).
- Additional contacts may be added, if applicable.

The department manager or equivalent is responsible for notifying:

- The facility safety representative or equivalent.
- The water resources manager or equivalent.

The (City or County) Office of Emergency Management is responsible for notifying the following:

- Your contact in your local weather forecast office in the National Weather Service Southern Region's office.
- Your district's contact for the Texas Department of Public Safety.
- Your district's contact for the Texas Department of Transportation.

POSSIBLE, IMMINENT, OR DAM FAILURE NOTIFICATION FLOWCHART FOR A LARGE DAM

This page summarizes the flowchart depicted on page 34.

Disclaimer: This sample notification flowchart is provided to you as guidance; please tailor your flowchart to the specific needs of your dam. Include contacts' names, titles, and phone numbers (office, cell, and 24-hour) for all sections mentioned below, if applicable.

Include in this section the dam owner's name, and dam facility staff names (if applicable) such as: owner's emergency planning manager, shift manager, and backup coordinator.

The dam owner or staff is responsible for notifying the following agencies or organizations:

- The dam engineer or additional contacts.
- The department manager or equivalent.
- Emergency 911, Police, or (AAA) County Sheriff.

The dam engineer or the additional contact is responsible for notifying the following:

- TCEQ's Dam Safety Program (Include the following phone numbers in this section: Daytime: 512-239-0326 and 24-hour: 888-777-3186).
- Emergency contractors (See Tab 6).
- Additional contacts may be added, if applicable.

The department manager or equivalent is responsible for notifying the following:

- The facility safety representative or equivalent.
- The water resources manager or equivalent.
- The public affairs contact or equivalent.

Emergency 911, Police, or (AAA) County Sheriff are responsible for notifying the following:

- (City or County) Office of Emergency Management. Include contact information for all potentially impacted districts and area offices.
- The affected downstream residents, their location, addresses, phone numbers (if readily available), and the affected road names should be listed. If necessary, create and reference a separate page. Media outlets or the (City or County) Office of Emergency Management may also notify residents.

The (City or County) Office of Emergency Management is responsible for notifying the following:

- Your local Weather Forecast office of the National Weather Service Southern Region.
- Your district's contact for the Texas Department of Public Safety.
- Your district's contact for the Texas Department of Transportation.
- The affected downstream residents, their location, addresses, phone numbers (if readily available), and the affected road names should be listed. If necessary, create and reference a separate page. Media outlets or the Emergency 911, Police, or (AAA) County Sheriff may also notify residents.
- Additional contacts may be added, if applicable.

The National Weather Service Southern Region or the Texas Department of Public Safety is responsible for notifying the following:

- Your district's media outlets including radio and tv stations.

WATCH CONDITION NOTIFICATION FLOWCHART FOR AN INTERMEDIATE OR SMALL DAM

This page summarizes the flowchart depicted on page 65.

Disclaimer: This sample notification flowchart is provided to you as guidance, please tailor your flowchart to the specific needs of your dam. Include contacts' names, titles, and phone numbers (office, cell, and 24-hour) for all sections mentioned below, if applicable.

Include a name, title, and contact information of the observer, who may be:

- Anyone, such as a passerby who is not familiar with the dam.
- A designated person who is on-site regularly and who would most likely detect an emergency condition.

The observer notifies the dam owner or operator.

The dam owner or operator is responsible for notifying the following agencies or organizations:

- Dam engineer or additional contact.
- (City or County) Office of Emergency Management. Include contact information for all potentially impacted districts and area offices.

The dam engineer or the additional contact is responsible for notifying the following:

- Additional contacts may be added, if applicable.

The (City or County) Office of Emergency Management is responsible for notifying the following:

- Your local Weather Forecast office of the National Weather Service Southern Region.
- Your district's contact for the Texas Department of Public Safety.
- Additional contacts may be added, if applicable.

POSSIBLE, IMMINENT, OR DAM FAILURE NOTIFICATION FLOWCHART FOR AN INTERMEDIATE OR SMALL DAM

This page summarizes the flowchart depicted on page 66.

Disclaimer: This sample notification flowchart is provided to you as guidance, please tailor your flowchart to the specific needs of your dam. Include contacts' names, titles, and phone numbers (office, cell, and 24-hour) for all sections mentioned below, if applicable.

Include a name, title, and contact information of the observer, who may be:

- Anyone, such as a passerby who is not familiar with the dam.
- A designated person who is on-site regularly and who would most likely detect an emergency condition.

The observer notifies either the dam owner or operator or the Emergency 911, Police, or (AAA) County Sheriff.

The dam owner or operator is responsible for notifying the following:

- The dam engineer or additional contact.
- (City or County) Office of Emergency Management. Include contact information for all potentially impacted districts and area offices. Emergency 911, Police, or (AAA) County Sheriff may also contact this office.
- Emergency 911, Police, or (AAA) County Sheriff. The observer may also contact Emergency 911, Police, or (AAA) County Sheriff's office.

The dam engineer or the additional contact is responsible for notifying the following:

- TCEQ's Dam Safety Program (Include the following phone numbers in this section: Daytime: 512-239-0326 and 24-hour: 888-777-3186).
- Emergency contractors (See Tab 6).
- Additional contacts may be added, if applicable.

The (City or County) Office of Emergency Management is responsible for notifying the following:

- Your local Weather Forecast office of the National Weather Service Southern Region.
- Your district's contact for the Texas Department of Public Safety.
- Your district's contact for the Texas Department of Transportation.
- Additional contacts may be added, if applicable.

Emergency 911, Police, or (AAA) County Sheriff are responsible for notifying the following:

- (City or County) Office of Emergency Management. Include contact information for all potentially impacted districts and area offices. The dam owner or operator may also notify the (City or County) Office of Emergency Management.
- The affected downstream residents, their location, addresses, phone numbers (if readily available), and the affected road names should be listed. If necessary, create and reference a separate page. Media outlets or the Emergency 911, Police, or (AAA) County Sheriff may also notify residents. (City or County) Office of Emergency Management or media outlets may also notify residents.

The National Weather Service Southern Region or the Texas Department of Public Safety is responsible for notifying the following:

- Your district's media outlets including radio and tv station

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