Session 1
Texas Dam Safety Program

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Dam Safety Program

- Section Manager- Warren Samuelson, P.E.
- Team Leaders
  - Johnny Cosgrove, P.E.
  - Jeff Thomas, P.E., P.G.
  - Vacancy

- 21 Full Time Staff (Engineers, EITs, GIS Specialist, Technicians)
  - 1 Vacancy
Dam Safety Program

- Total dams -- 7,215
- Total High Hazard Dams -- 1,244
- Total Significant Hazard Dams -- 433
- Total High and Significant Hazard Dams -- 1,677
- Inspection every 5 years
Why is Dam Safety so Important?

- Lives and property are at risk
- Owner has liability, which could result in loss of millions of dollars if the dam should fail or cause damage downstream
Dam Exemptions

- Focus on high risk dams.
- Effective September 1, 2013. No expiration date.
- Per Legislation Passed, Exempt Dams Must Meet All 5 Criteria:
  - Privately owned
  - Less than 500 acre-feet maximum capacity
  - Located in a county with population less than 350,000 (per 2010 Census)
  - Located outside city limits
  - Low or significant hazard
Dam Exemptions

• Exempt dams are not regulated by Dam Safety Program
  ◦ Will not be inspected every 5 years (unless requested by owner)
  ◦ Should continue any maintenance
• Although there is no expiration date, an exempt dam may become non-exempt if any one of the 5 criteria change
What is an acre-foot?

Depth of water = 1 foot

Area of a football field = ~1 acre*

*1.3 total acres including end zones, 1.1 acres excluding end zones.

The amount of water covering one acre of surface area to a depth of one foot
Hazard Classification

- Based on potential damage to downstream life, property, and infrastructure
- NOT based on the condition of the dam
Hazard Classification

- **Low Hazard**
  - No loss of human life expected
  - No permanent habitable structures downstream of the dam
  - Minimal economic loss
  - Dams located in rural areas where failure may damage:
    - Occasional farm buildings
    - Limited agricultural improvements
    - Minor highways
Hazard Classification

- **Significant Hazard**
  - Possible loss of human life located in the breach inundation area downstream of the dam
    - 1 to 6 lives or
    - 1 to 2 habitable structures
  - Appreciable economic loss
    - Damage to isolated homes
    - Damage to secondary highways (defined by TCEQ)
    - Damage to minor railroads
    - Interruption of service or use of public utilities
Hazard Classification

- **High Hazard**
  - Expected loss of life located in the breach inundation area downstream of the dam
    - 7 or more lives or
    - 3 or more habitable structures
  - Excessive economic loss to
    - Public facilities (i.e. water/wastewater plants, pump stations, power transmission facilities, etc.)
    - Agricultural, industrial, or commercial facilities
    - Main highways (defined by TCEQ)
    - Railroads used as major transportation
Dam Safety Program
What We Do

- Inspect Dams Every 5 Years
  - Routine, Construction, Complaint, Breached/Failed
- Review H&H Studies and Breach Analyses
- Review Plans and Specifications For New Dams or Dam Modifications/Repairs
- Review Emergency Action Plans
- Attend Tabletop Exercises
- Dam Owner Outreach
Owner Responsibilities

• Owner responsible for operating and maintaining dam in a safe manner
• Owner responsible for addressing all maintenance and safety concerns identified during an inspection
• Owner shall ensure that necessary maintenance, repairs, alterations, or modifications are initiated and completed in a timely manner
Owner Responsibilities

• Owner has the legal duties, obligations, and liabilities incident to ownership or operation
• **Dam Owner is liable**
• Knowledge = culpability
• 30 TAC §299.41
Kaloko Dam, Hawaii

- 40 feet high, 1,200 AF
- 7 people died
- Multiple law suits
- 7 charges of manslaughter
- $1.5 million assessed to state
- $25 million total assessment
Will TCEQ Enforce?

- TCEQ will not require the dam owner to breach the dam or drain the lake simply because they do not meet all of the requirements.
- TCEQ will execute our enforcement powers if the dam presents an unacceptable threat to public safety and dam owner is making no attempt to alleviate the threat - Failure to act.
What should the owner do?

- Evaluate and prioritize
- Look at phased approach to needs of the dam
- For example:
  - Possibly making structural upgrades; and
  - Correcting serious deficiencies from maintenance neglect over the years.
  - Instead of hiring an engineer to perform a hydrologic and hydraulic analysis, which could result in an expensive study and costly modifications, especially if the dam passes more than 50% of the PMF
Owner’s Responsibility

- Plan and specifications for repair, removal, or rehabilitation are required to be submitted by a professional engineer for TCEQ review and approval before any works starts.

- If a dam is to be removed (often referred to as decommissioned), the plans need to show that there will be no impoundment during passage of the design flood.
Emergency Action Plans

• An EAP is a formal, dynamic document that identifies potential emergency conditions at a dam and specifies preplanned actions and communications to be followed to minimize property damage and loss of life.
Emergency Action Plans

- All high and significant hazard dams are required to have an EAP
- Exempt dams are not required to have an EAP, although it is a good idea to have one even if not required
Emergency Action Plans

- Recurring requirements after EAP is accepted:
  - Annual Updates
    - Send in pages that were updated
    - OR
    - Send in a letter stating no changes were necessary
  - Tabletop Exercises
    - Required at least once every 5 years
## Notification Flowcharts

<table>
<thead>
<tr>
<th>Watch Condition</th>
<th>Possible/Imminent Dam Failure</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Intended for internal communication</td>
<td>- Notify local authorities so they can make evacuations</td>
</tr>
<tr>
<td>- No evacuations</td>
<td>- Include local news outlets and National Weather Service to get messages out to the public</td>
</tr>
</tbody>
</table>
Watch Condition Notification Flowchart

**Dam Facility Staff:**
- Owner's Emergency Planning Manager: (Name) | Phone: (###) ###-####
- Shift Manager: (Name) | Phone: (###) ###-####
- Backup Coordinator: (Name) | Phone: (###) ###-####

**Dam Engineer or Additional Contact**
- (Name)
- Office: (###) ###-####
- Cell: (###) ###-####

**Department Manager or Equivalent**
- (Name)
- Office: (###) ###-####
- Cell: (###) ###-####

**(City or County) Office of Emergency Management**
- (Contact Name)
- Office: (###) ###-####
- 24/7 Phone: (###) ###-####

**TCEQ Dam Safety Section**
- Daytime: (512) 239-0326
- After Hours: (888) 777-3186

**Additional Contact**
- (Name)
- Office: (###) ###-####
- Cell: (###) ###-####

**Facility Safety Representative or Equivalent**
- (Name)
- Office: (###) ###-####
- Cell: (###) ###-####

**National Weather Service Southern Region**
- (Name) Office (Contact Name)
- Office: (###) ###-####

**Water Resources Manager or Equivalent**
- (Name)
- Office: (###) ###-####
- Cell: (###) ###-####

**Texas Department of Public Safety**
- (Name) District (Contact Name)
- Office: (###) ###-####

**Texas Department of Transportation**
- (Name) District (Contact Name)
- Office: (###) ###-####
- 24/7 Phone: (###) ###-####

**DISCLAIMER:**
This sample notification flowchart is provided to you as guidance. Please tailor your notification flowchart to the specific needs of your dam.

**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.
Possible, Imminent, or Dam Failure Condition Notification Flowchart

Possible, Imminent, or Dam Failure Condition Notification Flowchart

Dam Facility Staff:
Owner's Emergency Planning Manager (Name) | Phone: (###) ###-####
Shift Manager (Name) | Phone: (###) ###-####
Backup Coordinator (Name) | Phone: (###) ###-####

Emergency 911, Police, or AAA/County Sheriff
Phone: (###) ###-####

City or County Office of Emergency Management
(1)
Contact Name
Office: (###) ###-####
24/7 Phone: (###) ###-####

Facility Safety Representative or Equivalent
(1)
Contact Name
Office: (###) ###-####
Cell: (###) ###-####

TCEQ Dam Safety Section
Daytime: (512) 239-0326
After Hours: (888) 777-3188

Water Resources Manager or Equivalent
(1)
Contact Name
Office: (###) ###-####
Cell: (###) ###-####

Emergency Contractors
See Tab 6

Public Affairs or Equivalent
(1)
Contact Name
Office: (###) ###-####
Cell: (###) ###-####

Additional Contact
(1)
Contact Name
Office: (###) ###-####
Cell: (###) ###-####

Media Outlets:
Radio
TV Stations

National Weather Service
Southern Region
(1)
Contact Name
Office: (###) ###-####

Texas Department of Transportation
(1)
Contact Name
Office: (###) ###-####
24/7 Phone: (###) ###-####

Affected Downstream Residents

Affected Downstream Residents

DISCLAIMERS:
This sample notification flowchart is provided to you as guidance.
Please tailor your notification flowchart to the specific needs of your dam.

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.
3. Please see the inundation map in Tab 2.
Purpose

- Identify emergency conditions that could cause a dam failure
- Expedite effective responses during an emergency
- Prevent and/or reduce loss of life and property damage
# Emergency Detection, Evaluation, and Classification

## Detection
- Severe Storms/Inclement Weather
- Tornadoes
- Earthquakes
- Sabotage

## Signs of Failure
- Seepage
- Sliding
- Structural
- Overtopping
Watch Condition

- Issue first detected
- Repair issue, if possible
- Monitor the dam
- Downstream residents not notified on flowchart
Possible Dam Failure Condition

- The ‘Watch’ condition continues to worsen
- Save the dam
- Consider notifying downstream residents, depending on how much the condition worsens
Imminent Dam Failure Condition

- Someone has determined that conditions will continue to progress and there will be an uncontrollable release of water from the reservoir
- Save lives
- Notify/evacuate downstream residents
Dam Failure Condition

- The dam has failed and a flood wave is moving downstream
- Save lives
- Evacuate
downstream residents
Preventive Actions

• Include a routine inspection schedule and identify the person responsible for conducting inspections
  ◦ Important to inspect after significant rain events
• Specify actions to be taken before and after development of emergency conditions to prepare for an emergency (alternate routes, surveillance, dark)
  ◦ Evidence of Distress
  ◦ Indicate procedures and measures for timely:
    • Emergency Detection
    • Emergency Evaluation
    • Emergency Classification
Inundation Maps

- Required for every EAP
- Depicts areas that could potentially flood if the dam fails
- Used for evacuation planning by the local authorities
  - It is critical that local authorities review and provide input on necessary content and map scale
- Level of detail depends on the size of the dam and complexity of the floodplain
  - General
  - Detailed
Failing to Plan is Planning to Fail
‘An EAP is not worth the paper it’s printed on unless it works’
What is a Tabletop Exercise

- Informal meeting of key players involved with the EAP.
- A hypothetical (but possible) scenario is provided and emergency actions/procedures are then discussed.
- Focused more on problem-solving than decision making.
Have Someone You Trust

- During an emergency, it is useful to have someone who you trust verifying the information at the dam.
- It is helpful for them to be familiar with the dam and its appurtenances (i.e. spillways).
- Misinformation during an event will cause confusion for all parties.
Benefits of a Tabletop Exercise

- All responsible parties are together
- Informal meeting with low stress
- EMC can determine best available evacuation routes
  - Will flooding block important access roads or evacuation routes?
- Problems/issues with EAP are found and fixed that day
- Required by TCEQ
Dam Failures
Dam Failures

- Rainfall events in May, October, and December 2015 and March and April 2016
- 111 incidents
- Most of the incidents occurred at older dams
Questions