Ensuring Safety: Emergency Action Plans for Dams in Texas

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Introduction

- Dams play a crucial role in managing water resources across Texas, aiding in flood mitigation, ensuring water availability for agriculture and urban areas, supporting ecosystems, and providing recreational opportunities such as boating, fishing, and wildlife habitat.
- Today, we’ll explore the importance of EAPs in mitigating those risks and ensuring public safety.
- Additionally, we will discuss the importance of keeping your EAP up to date with current information.

What is an Emergency Action Plan (EAP)

- An EAP is a comprehensive document outlining procedures to minimize loss of life and property in the event of a dam failure or emergency.
- The EAP outlines emergency procedures, evacuation plans, communication protocols, and coordination with emergency responders.
- EAP’s do not require a licensed engineer to complete; however, a licensed engineer is required to produce detailed inundation maps.
- A template to make an EAP can be found on the TCEQ Dam Safety website in the *“Guidelines for Developing Emergency Action Plans for Dams in Texas”*

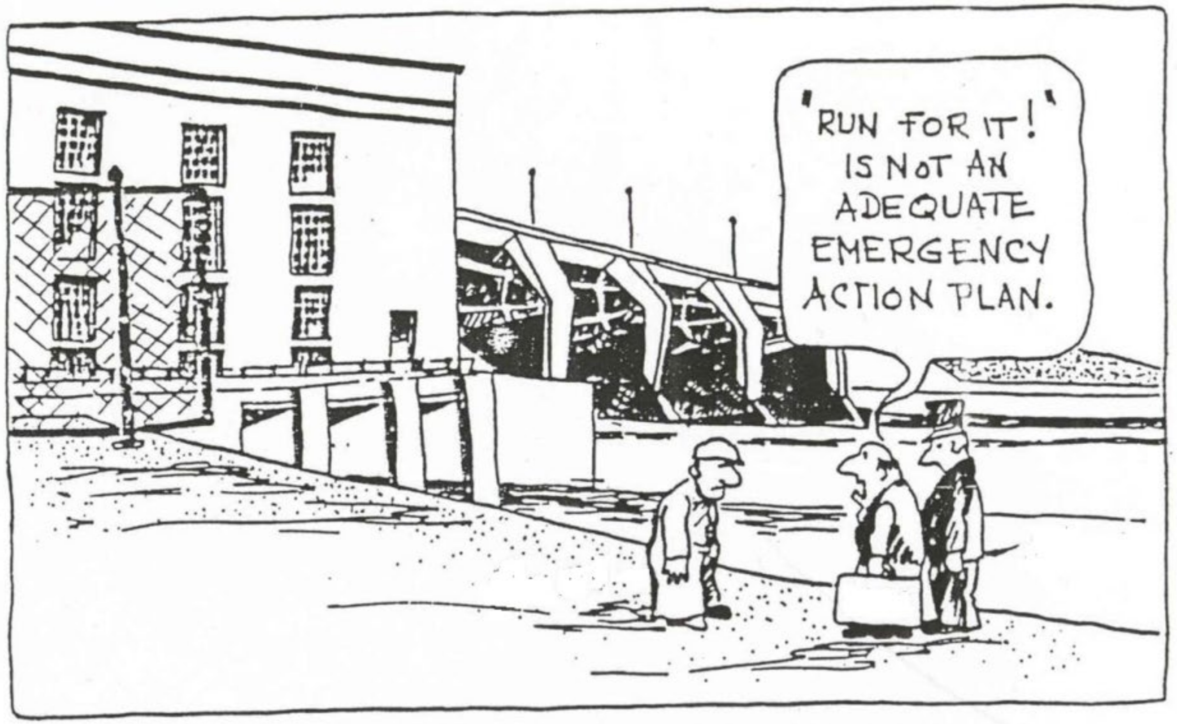
https://www.tceq.texas.gov/downloads/compliance/publications/gi/gi-394.pdf

Who needs an EAP?

- Chapter 299 requires:
    - *“The owners of all high- and significant-hazard dams shall prepare an EAP to be followed by the owner in the event or threat of a dam emergency.”*
    - *“The owner of an existing high- or significant-hazard dam shall submit the EAP to the executive director for review.”*
    - *“The owner shall prepare the EAP using guidelines provided by the executive director using a format approved by the executive director before the plan is prepared.”*
    - *“The owner shall review the EAP annually, update the EAP as necessary, and submit a copy of the updated portions of the EAP to the executive director annually.”*
    - *“The owner shall perform a tabletop exercise of the EAP at least every five years.”*

Importance of EAPs for Dam Safety

- Early warning system
- Coordination
- Public Awareness



Emergency Action Plan in Action (Watch Condition)

- **Scenario:** A severe storm system is forecasted to bring heavy rainfall to the region where a large dam is located. The dam, which serves as a vital component of flood control infrastructure, is at risk of reaching its capacity due to the anticipated influx of water.
- **Early Detection**
- **Activation of EAP (Watch Condition)**
- **Notification**

Emergency Action Plan in Action (Possible, Imminent, or Dam Failure Condition)

- Evacuation Procedures
- Communication and Coordination
- Resource Deployment
- Public Information

Emergency Action Plans After an Event

- **Post-Emergency Evaluation**
- **Effectiveness of the EAP is measured in lives saved**

Tabletop Exercises

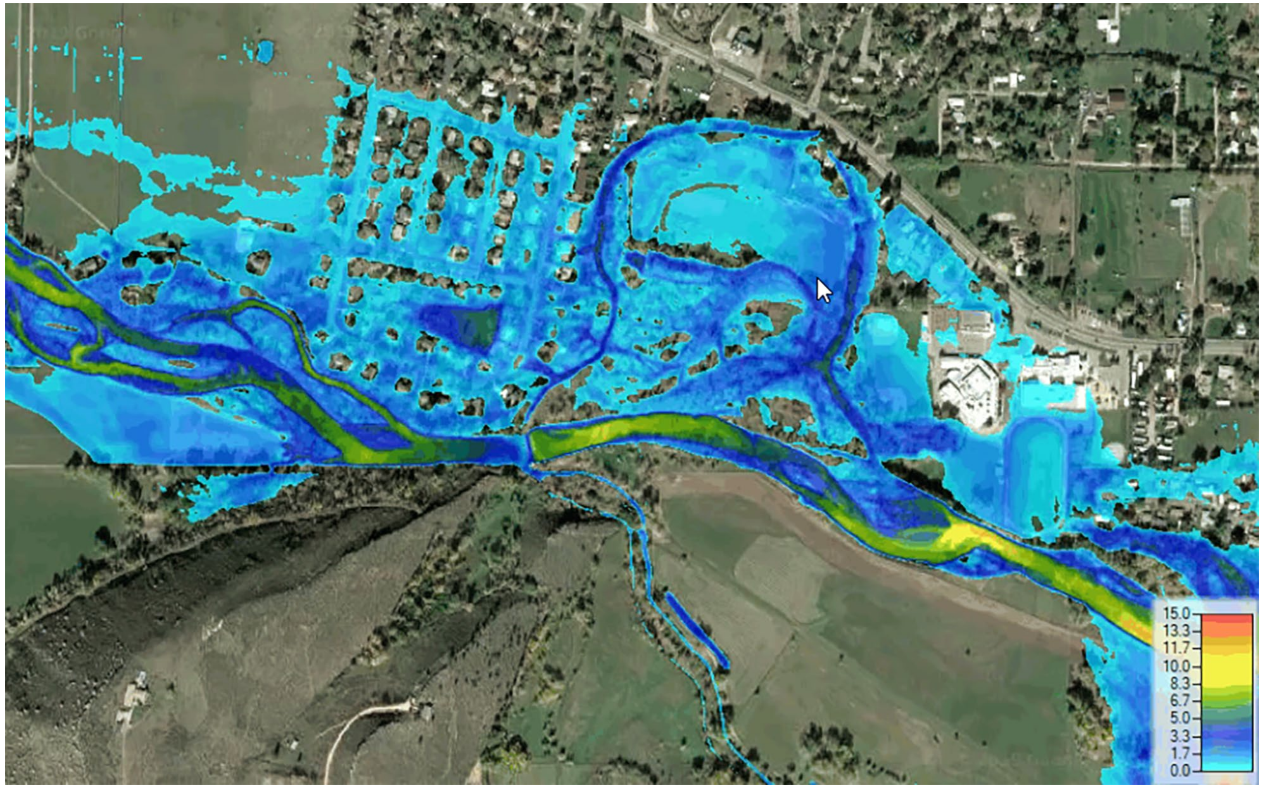
- Required every 5 years
- Evaluate
- Improve
- Collaborate
- Familiarize
- Lessons Learned

Updating Your EAP

- Must be completed annually
- A list of items to think about when updating your EAP:
  - New contact information for downstream residents
  - Change in Emergency Management Coordinator
  - New development and changing infrastructure downstream of the dam
  - Updated road classifications by TxDOT
  - New deficiencies in the dam
  - Change in personnel and/or caretaker at the dam

Inundation Mapping

- Identify areas at risk
- Valuable information
- Not all inundation maps are created equal
- Integral part of emergency response
- Continuously updated

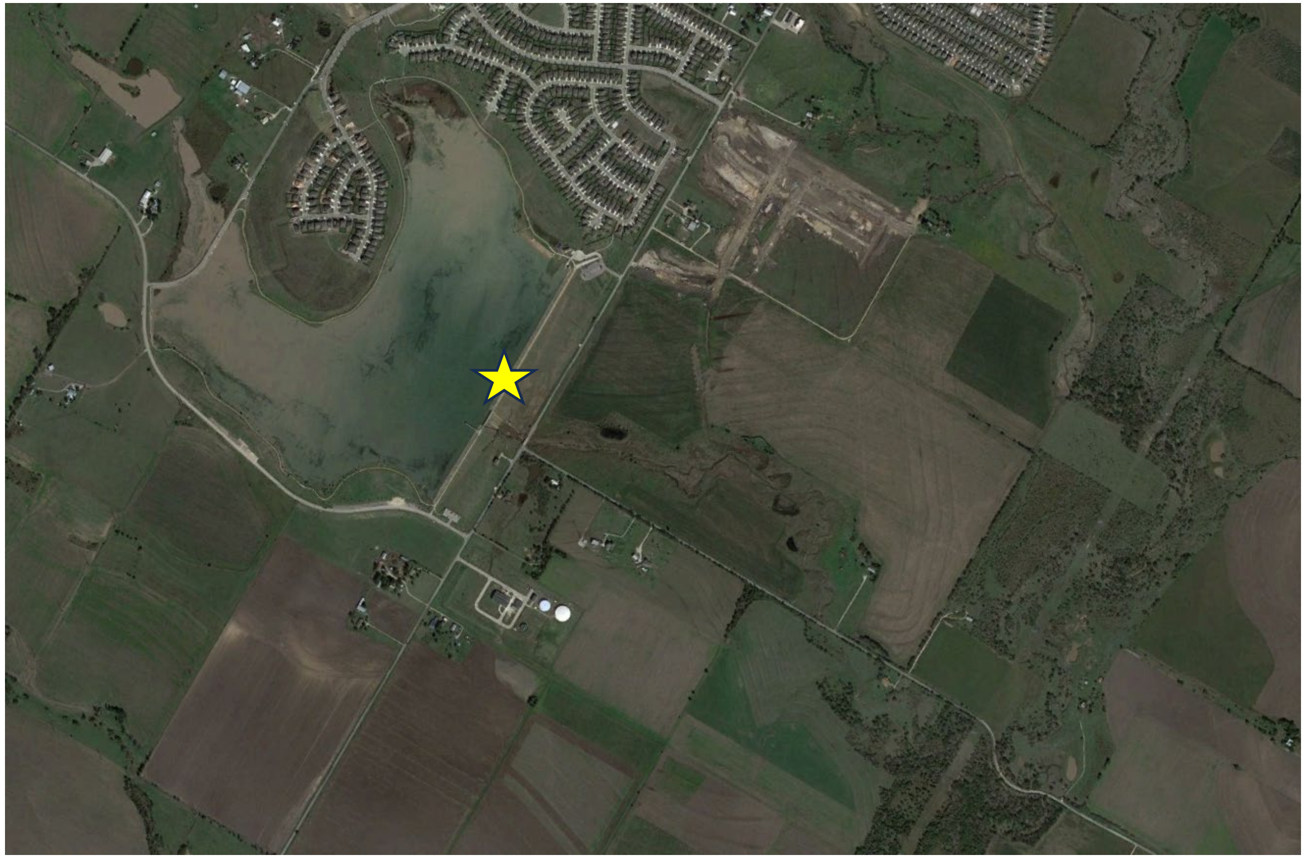


Updating Inundation Basemaps

- Accuracy
- Effective emergency response strategies (evacuations)
- Inform the public potentially at risk (preparedness)
- Compliance
- Continual improvement

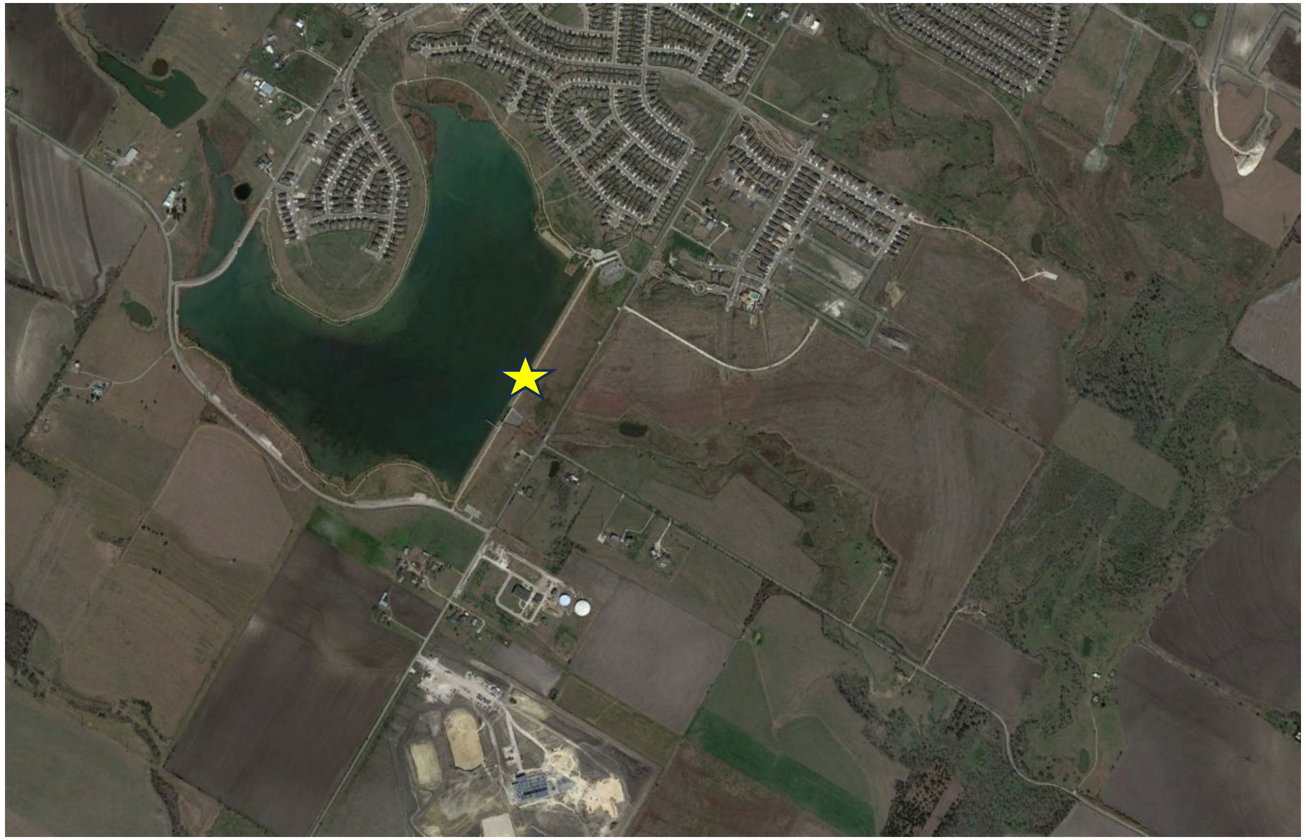
Case Study (1/4)

- Aerial imagery taken October 2013
- Note the lack of development pictured downstream of the dam



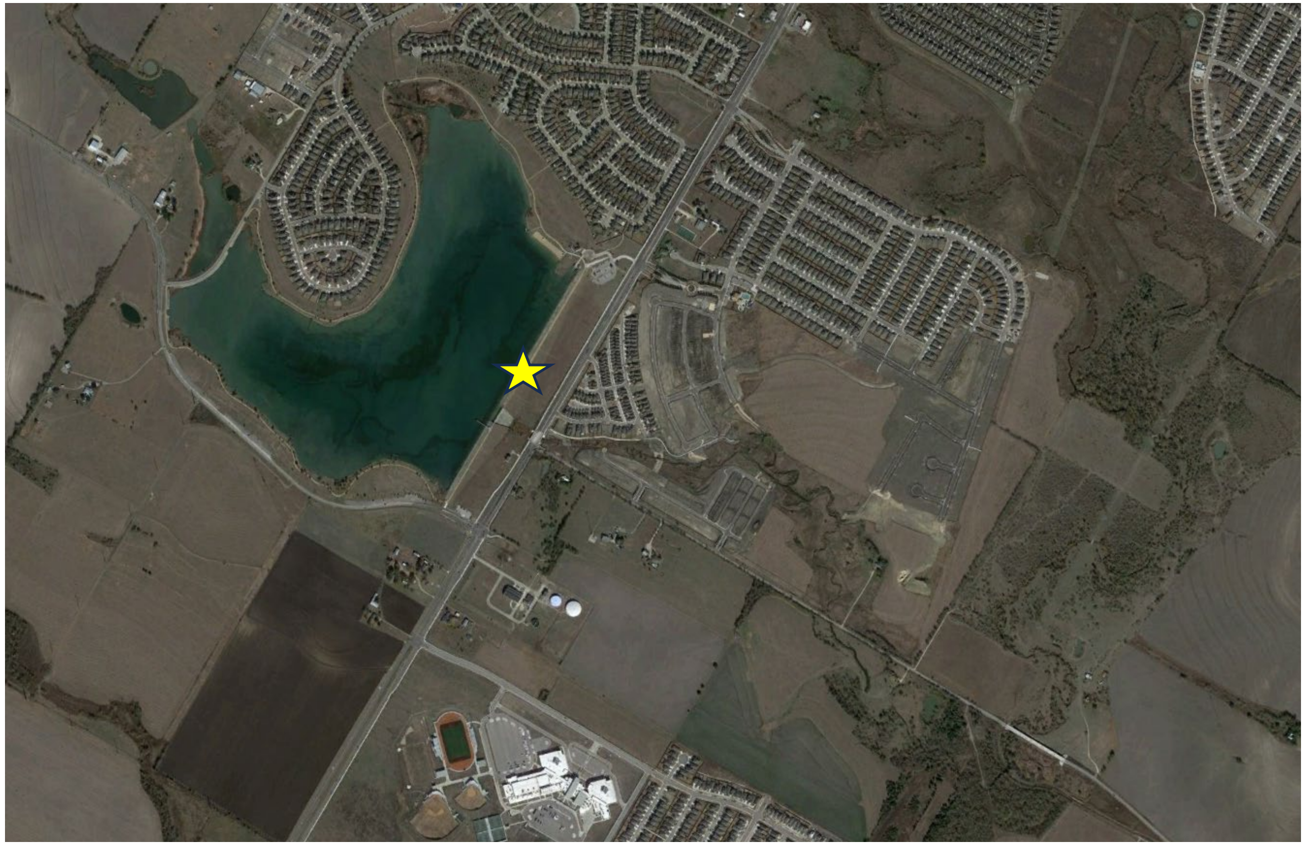
Case Study (2/4)

- Aerial imagery taken February 2016
- Note development starting downstream of the dam



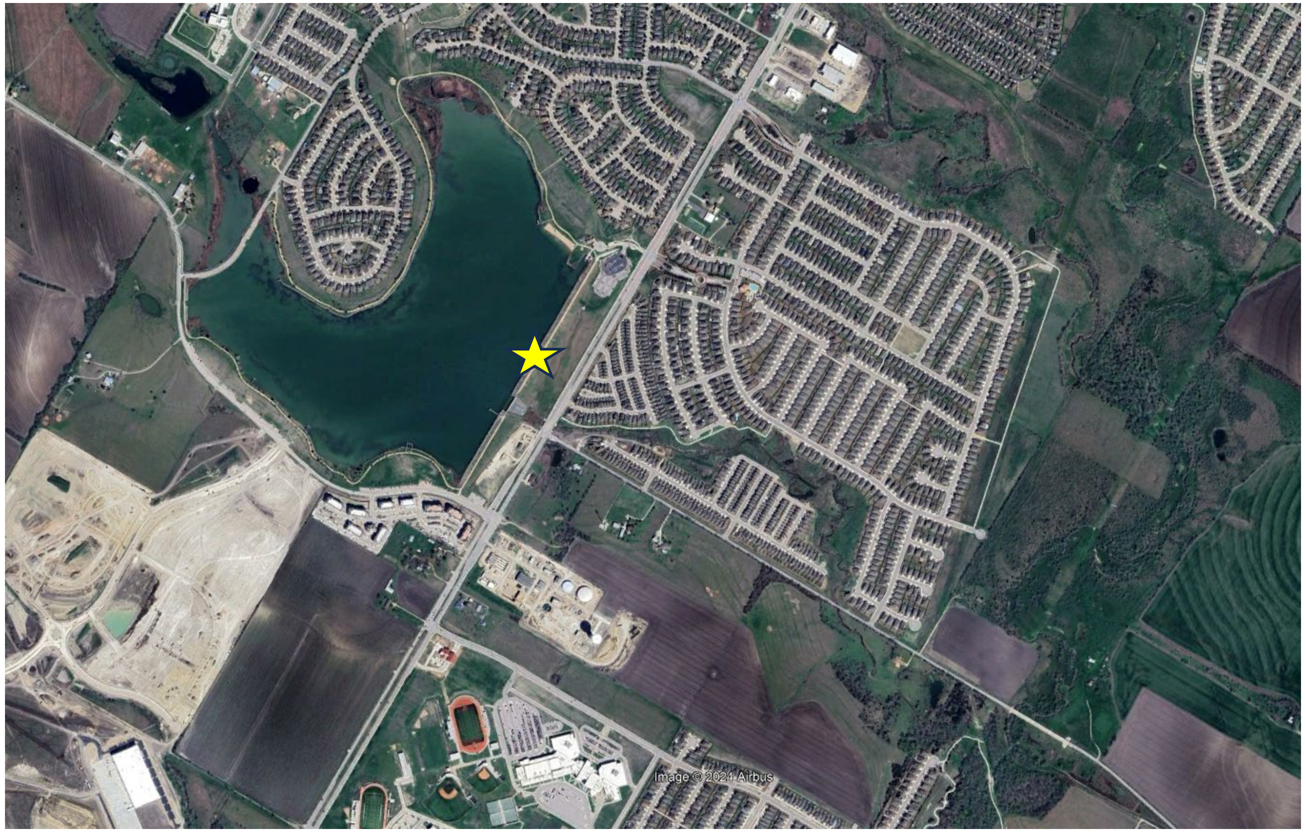
Case Study (3/4)

- Aerial imagery taken November 2019
- Note completed subdivisions downstream of the dam
- A school has also been constructed



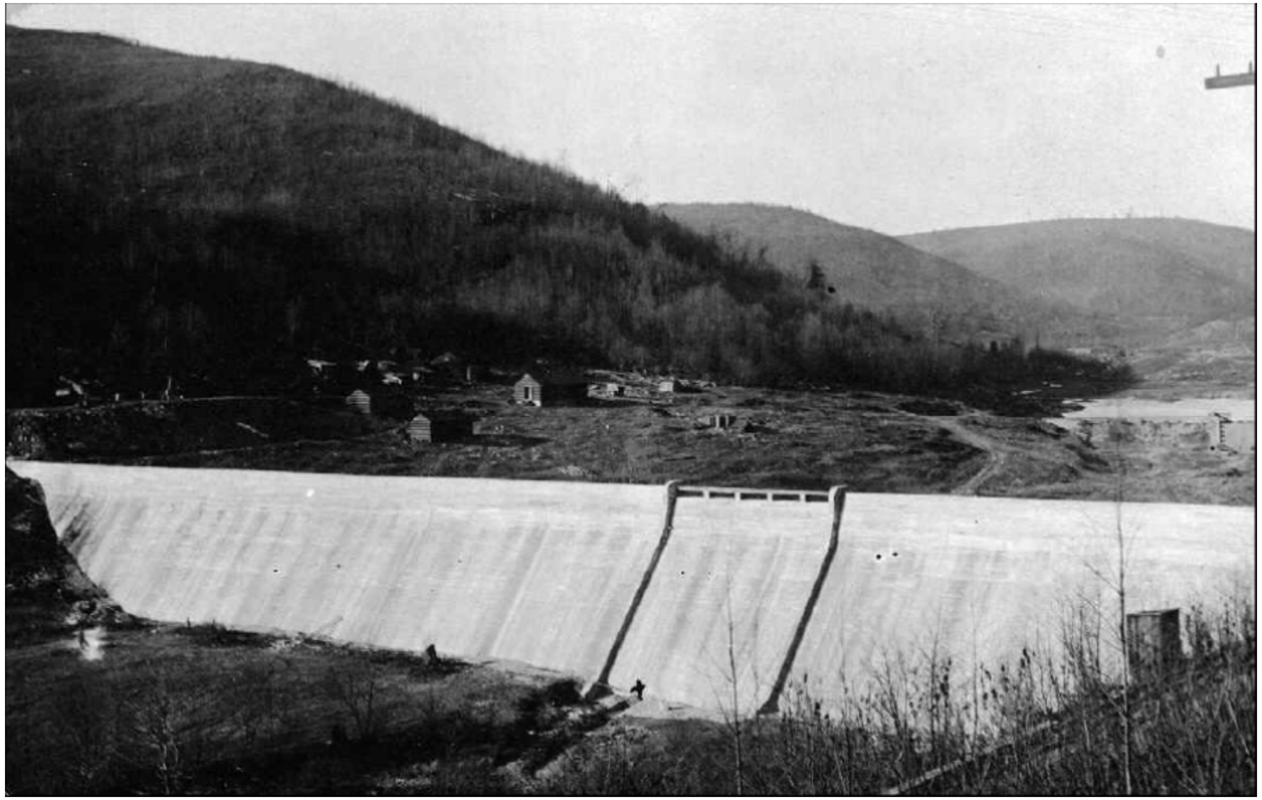
Case Study (4/4)

- Aerial imagery taken March 2024
- Note completed subdivisions downstream of the dam



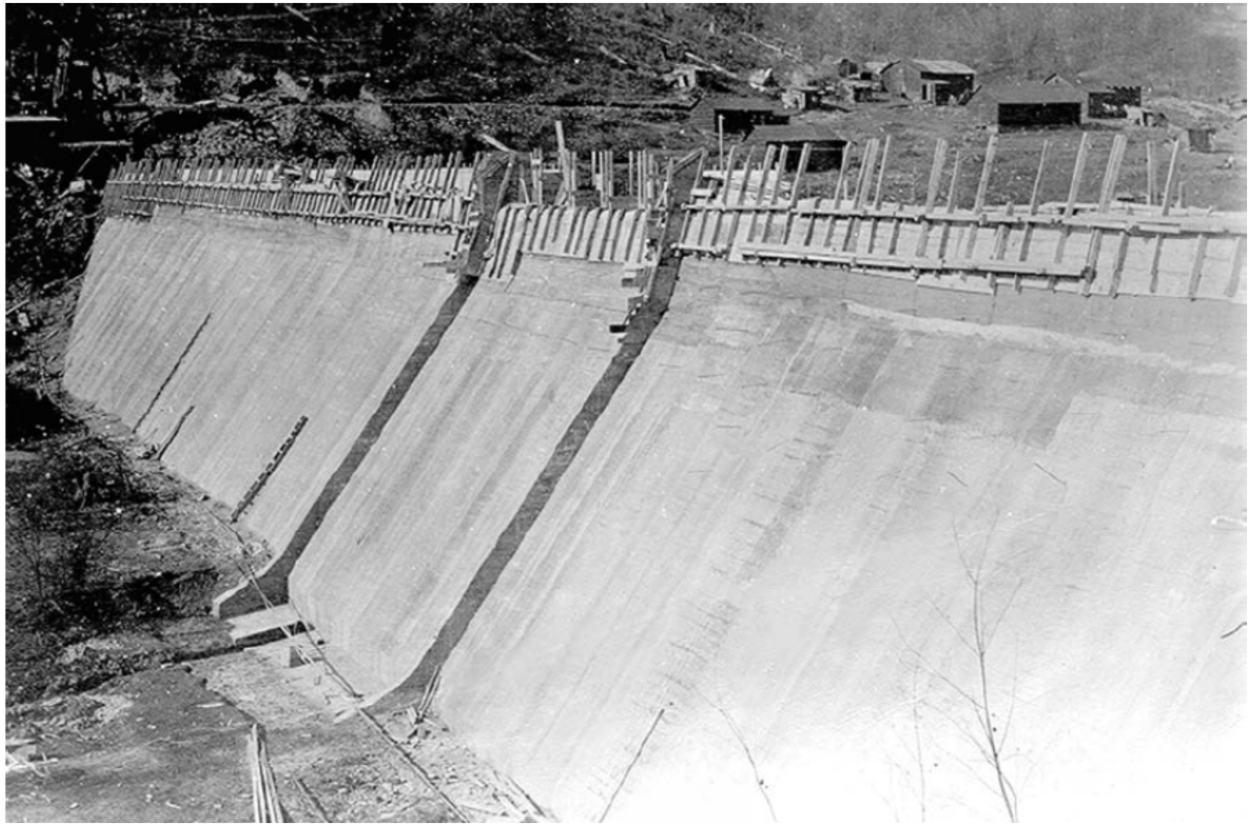
Austin Dam (also known as Bayless Dam)

- **Location**: Austin, Pennsylvania
- **Year Constructed**: 1909
- **Primary Purpose**: Water Supply
- **Date of Incident**: September 30, 1911
- **Fatalities**: 78
- **Property Damage**: $200 Million (adjusted inflation to 2024)



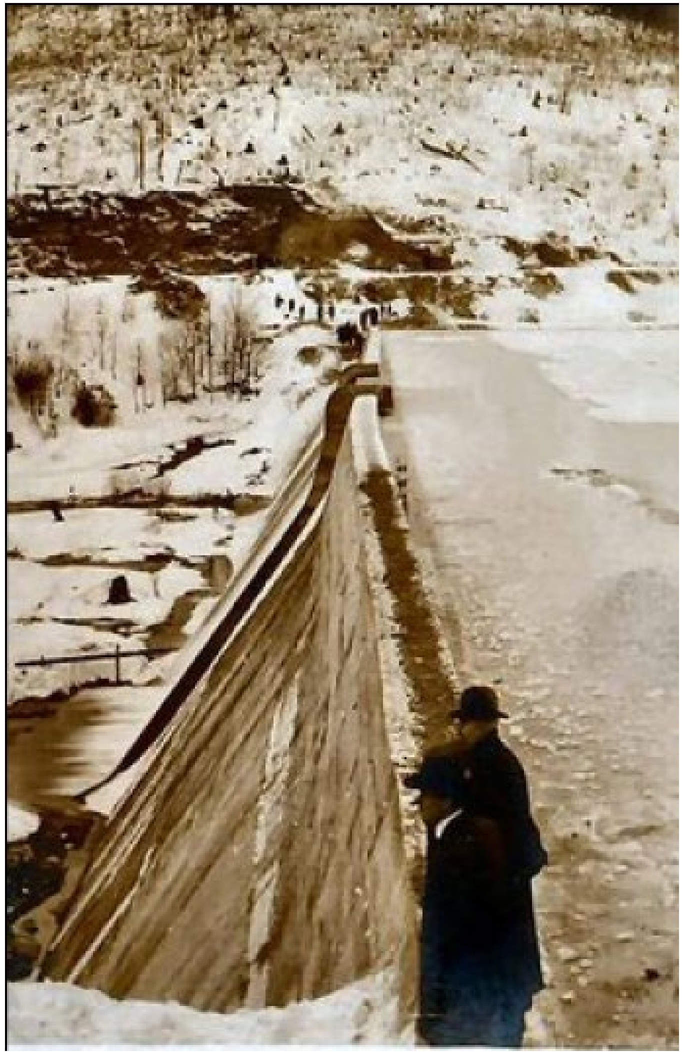
Description and Background

- Austin, Pennsylvania was a town of approximately 2,500 people
- Concrete gravity dam that stood 50 feet tall and 544 feet long
- Constructed on Freeman's Run for the purpose of supplying water to the Bayless Paper Mill
- Design engineer T. Chalkley Hatton retained by the Bayless Paper Mill company president George C. Bayless
- Hatton was given two objectives by the client:
  - Construct a dam able to hold 200 million gallons
  - Complete the project with a budget of $85,000



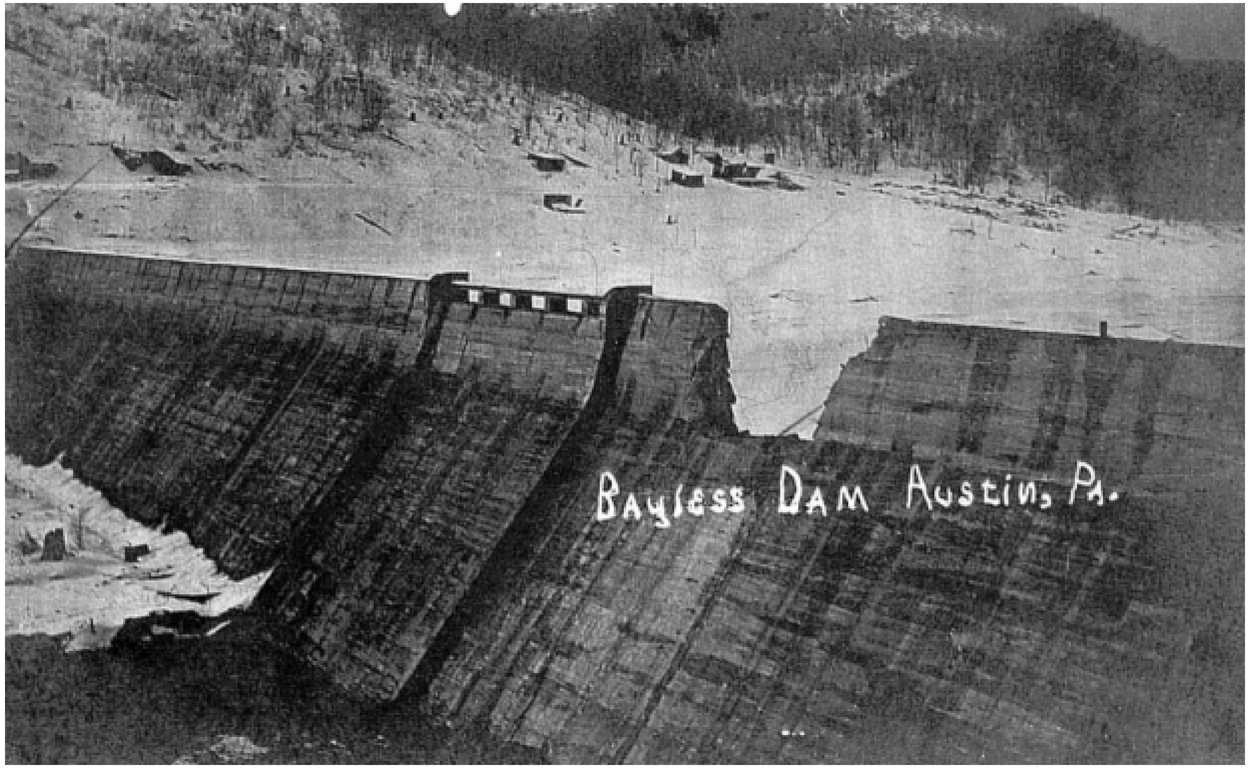
Construction Issues

- It became evident that the cost of the dam would slightly overrun the budget, and Hatton began getting pressured to make alterations to reduce costs.
- Bayless began instructing construction workers to raise the crest of the dam and spillway, increasing storage capacity, without Hatton's knowledge.
- In an effort to reduce costs, a minimal amount of iron rods were used to secure the dam to the foundation rock.
- Because it was deemed too expensive, an underground vertical slab, which had been designed to prevent water from seeping under the dam, was not built.
- In a rush to complete the project, some concrete was poured during freezing weather and only allowed to cure for 6 weeks before the reservoir was filled.



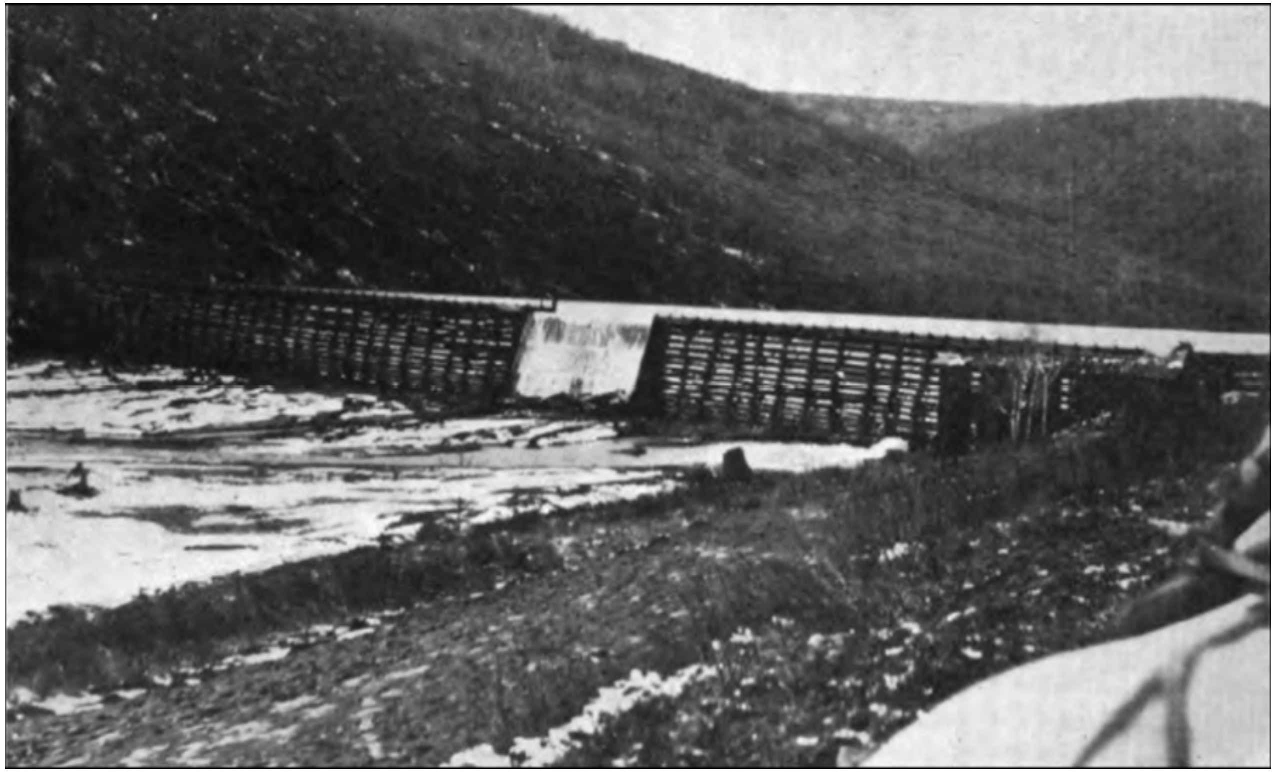
Problems Start Immediately

- Construction of the dam was completed on December 1, 1909
- A warm period in January 1910 combined with rain caused snowmelt that filled the reservoir within 3 days, activating the spillway for the first time.
- January 22, 1910, a large slough occurred at the left abutment of the dam on the downstream side.
- Seepage flow was also detected along the toe of the dam.
- The next day, the dam slid downstream on its foundation, deflecting 18 inches at the toe and 31 inches at the crest and cracking in several places.



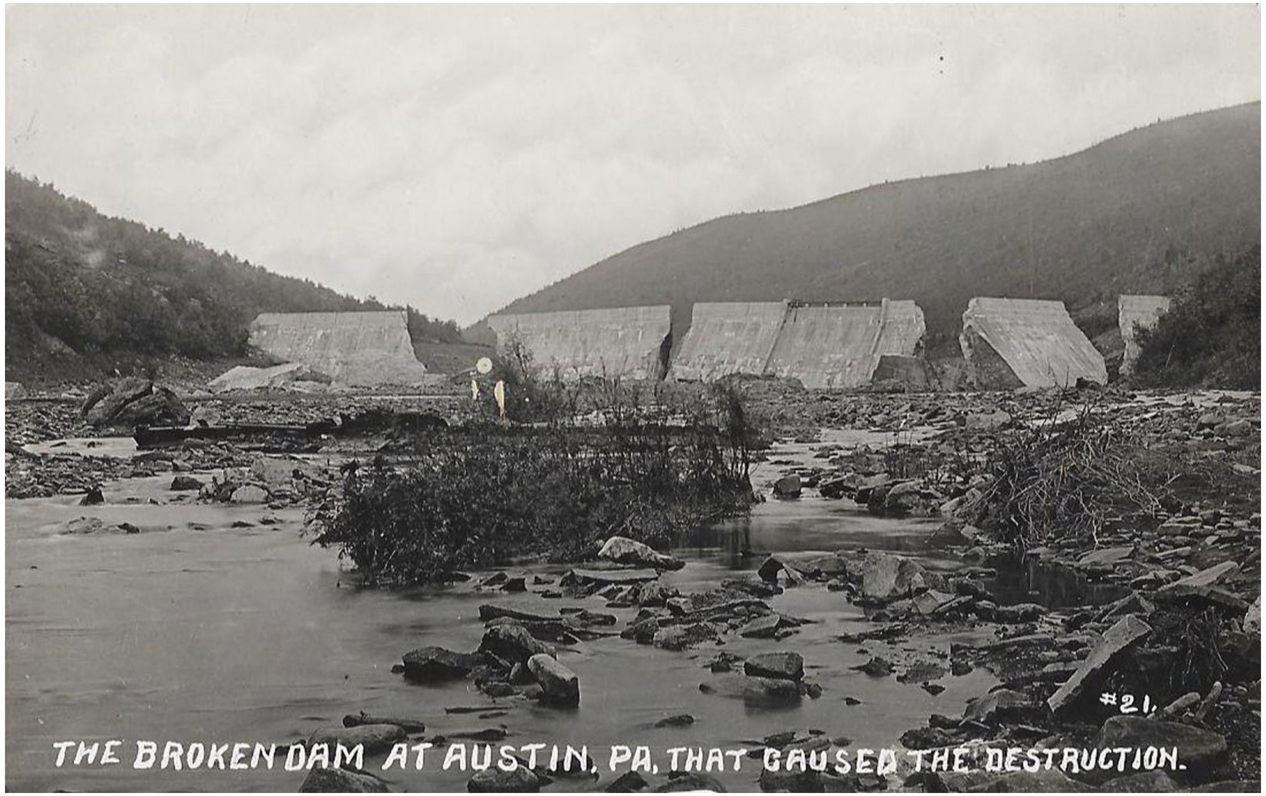
Attempt at Repair

- Hatton consulted Edward Wegmann, an expert on gravity dam design, and together they developed repair options to present to Bayless.
- Hatton and Wegmann recommended extending the cut-off wall deeper and constructing a rockfill buttress downstream of the dam.
- Construction then commenced on a 30-foot-tall timber crib dam, to provide water for the mill while minor repairs were made to the concrete dam.
- Over the next ten months, small repairs were made to the concrete dam to prevent leakage.



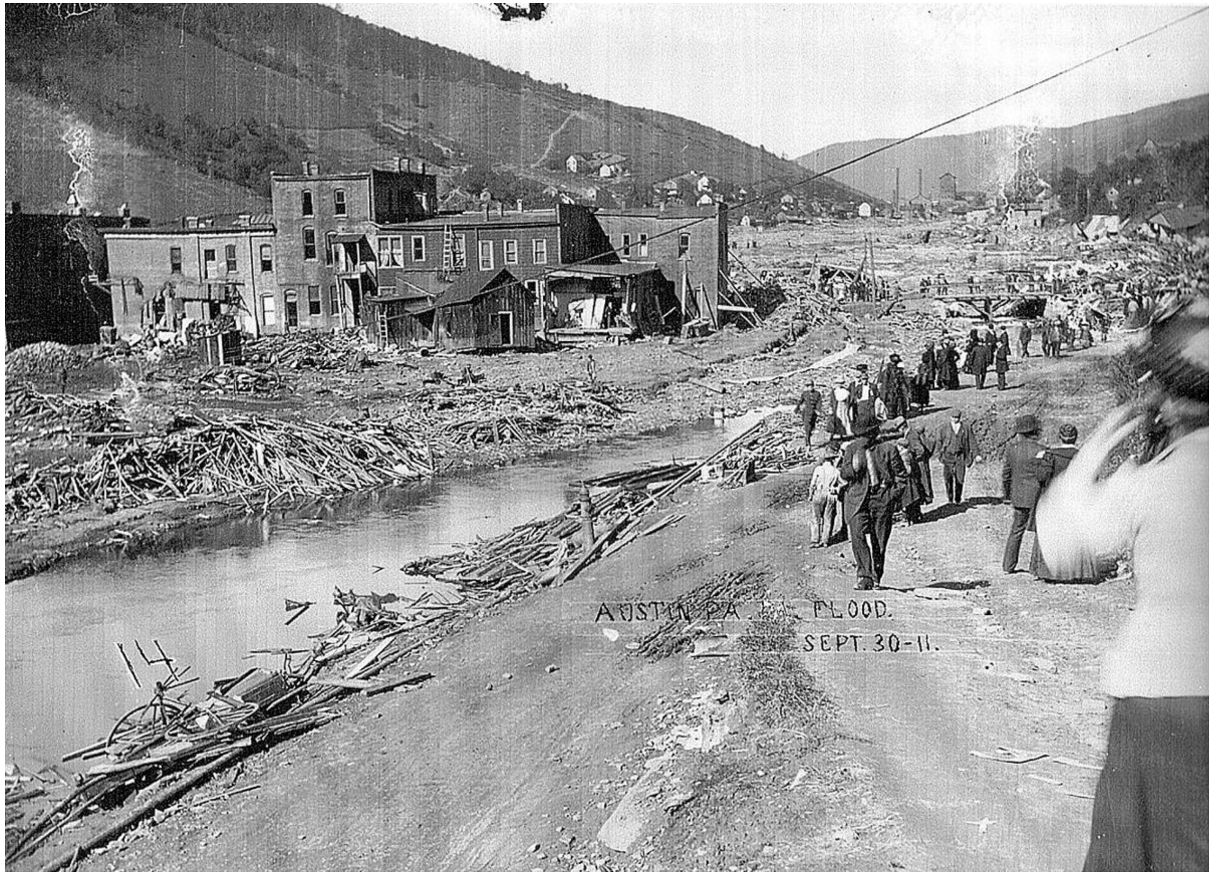
Dam Failure

- On September 15-17, 1911, heavy rains fell on the watershed behind the dam, and the Austin Dam filled to within several inches of the spillway crest.
- This was the first time the dam had a full reservoir behind it since the partial failure that occurred in January 1910.
- Several eyewitnesses reported that by September 30th the reservoir level was within a half inch of the spillway crest and leakage through and under the dam was widespread and increasing rapidly.
- At some point between approximately 2:00 and 2:15 pm on September 30, 1911, the Austin Dam suffered a sudden and devastating collapse.



Aftermath

- The downstream towns of Austin and Costello were effectively destroyed by the wave of water released.
- 78 people lost their lives as a result of the disaster.
- Damages were estimated to be between $3-6 million (~$200 million in 2024).
- The Director of Engineering at Lehigh University, Professor Frank P. McKibben, was hired to investigate the failure. McKibben's findings concluded, "The failure of this dam is due to sliding as a result of faulty foundation, faulty design, faulty construction, and faulty operation."


AUSTIN PA. FLOOD.
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MAIN ST., AUSTIN, PA., AFTER THE FLOOD.


AUSTIN DAM-FLOOD WRECK

DAM SAFETY PROGRAM

Texas Commission on Environmental Quality

Questions?

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