

# LAKE BRAZOS DAM

## ENGINEERING SERVICES



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Presentation to City Council

November 19, 2019

# TODAY'S PRESENTATION

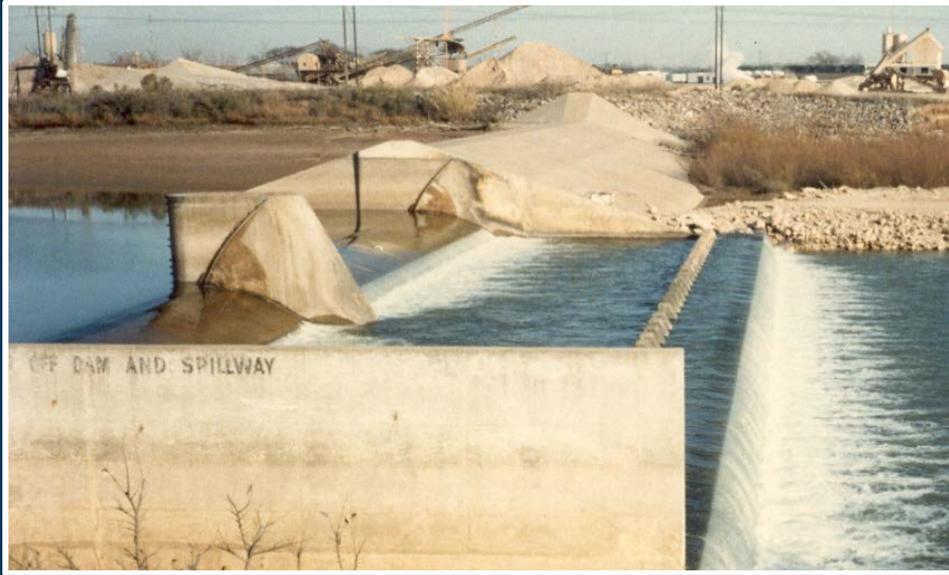
- Dam Background
- Embankment Evaluation and Proposed Remedial Action



An aerial photograph of the Lake Brazos Dam spillway, showing a series of concrete spillway gates. The water is a deep blue, and the spillway structure is a lighter blue-grey. The text is overlaid in the center of the image.

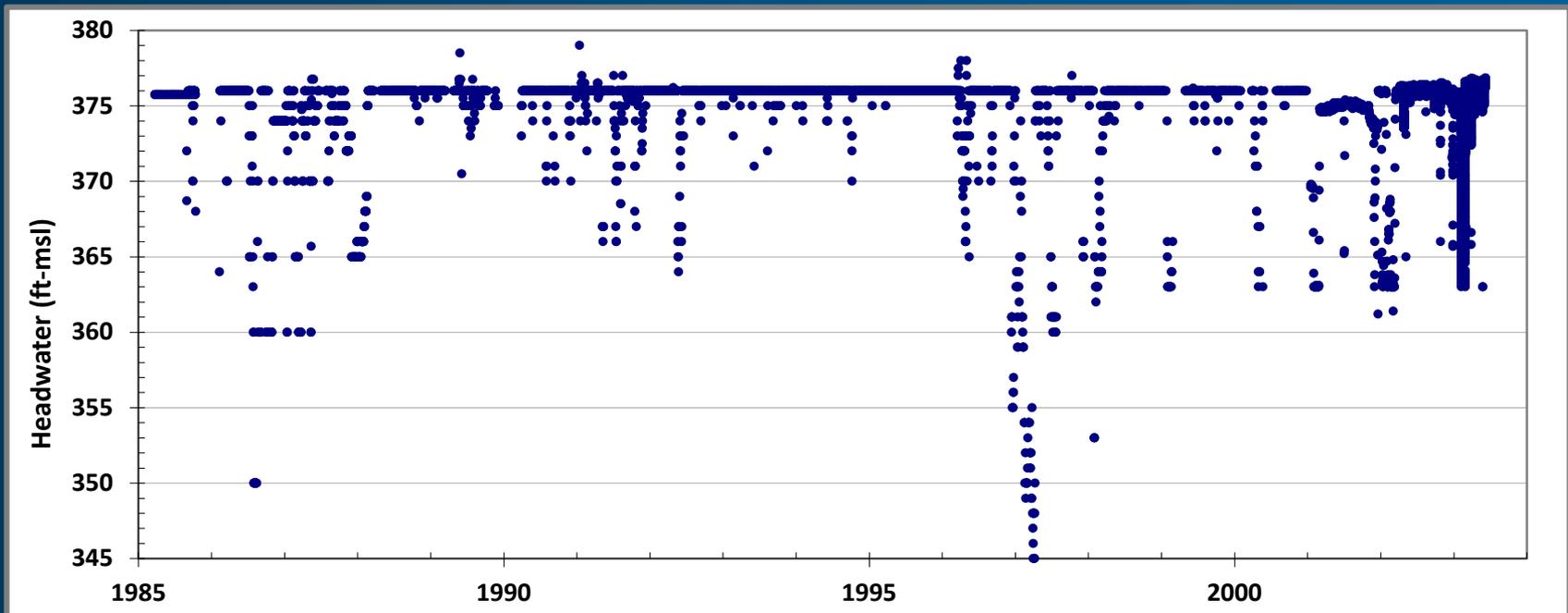
# LAKE BRAZOS DAM BACKGROUND

# ORIGINAL LAKE BRAZOS DAM



# PROBLEMS

- Costly gate operations
- Unreliable lake level
- Environmental impacts

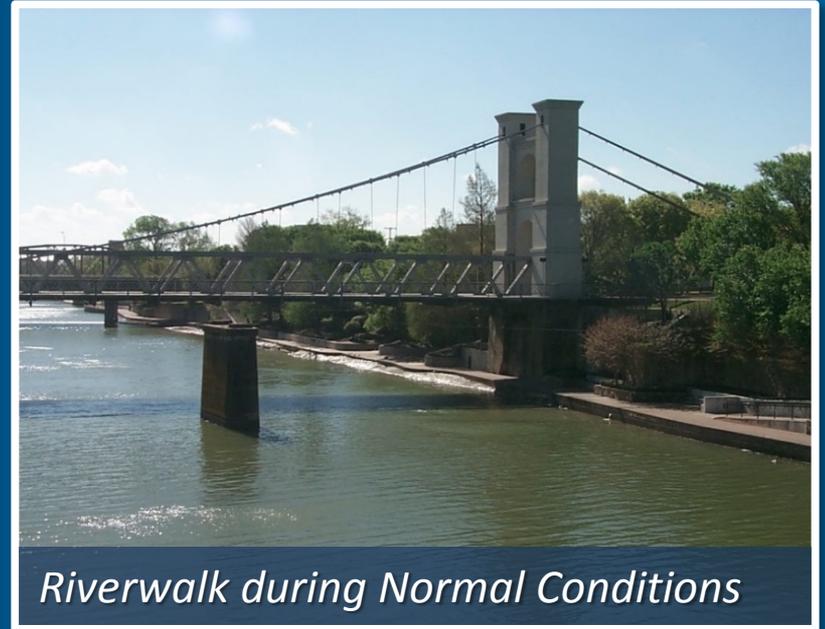


\*20% of lake level readings are below normal pool. Approximately 2.8 years of low lake levels over the past 20 years.

# LABYRINTH WEIR BACKGROUND

## PROJECT GOALS

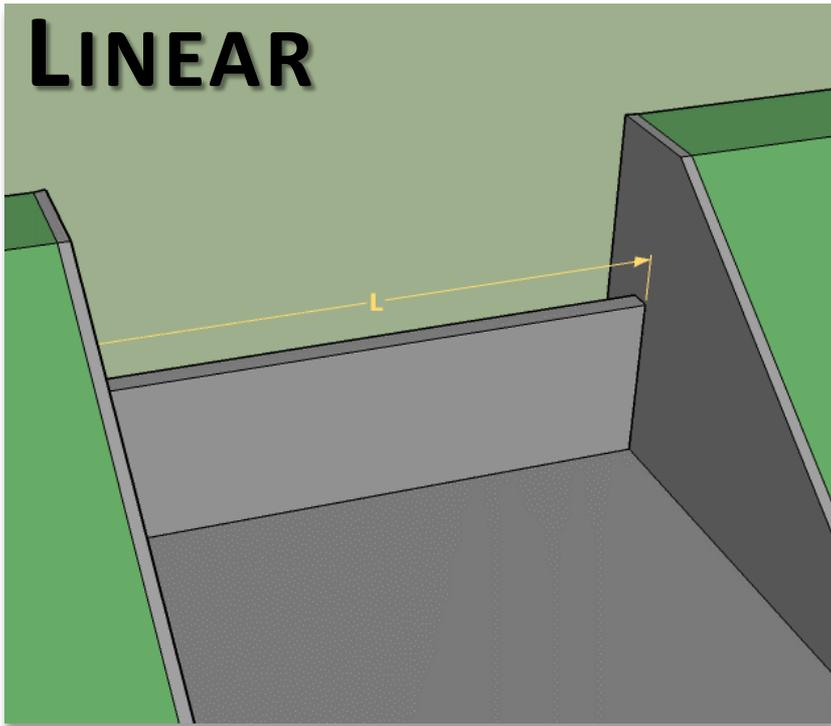
- Improve lake reliability
- Maintain FEMA floodplain upstream
- Revitalize Downtown
- Reduce costly long-term maintenance



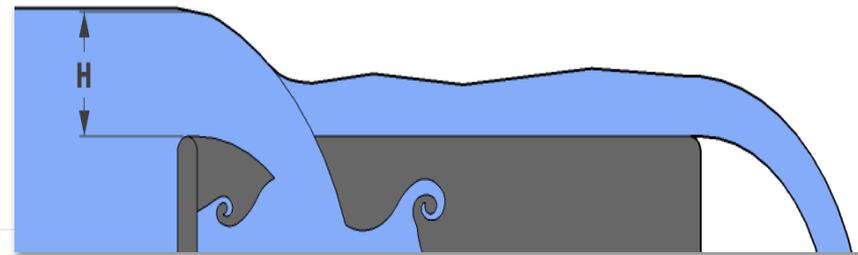
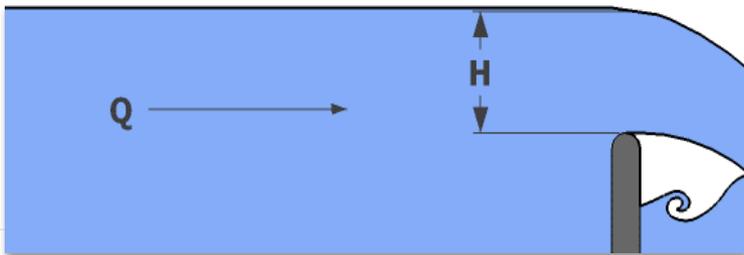
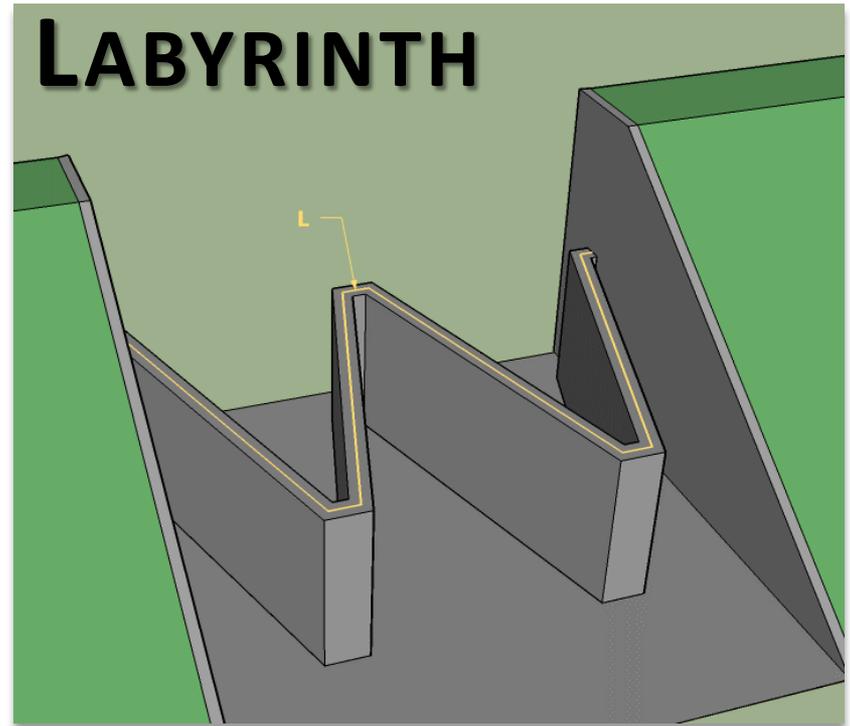
# HOW DO LABYRINTH WEIRS WORK?

$$Q = C \text{L} H^{1.5}$$

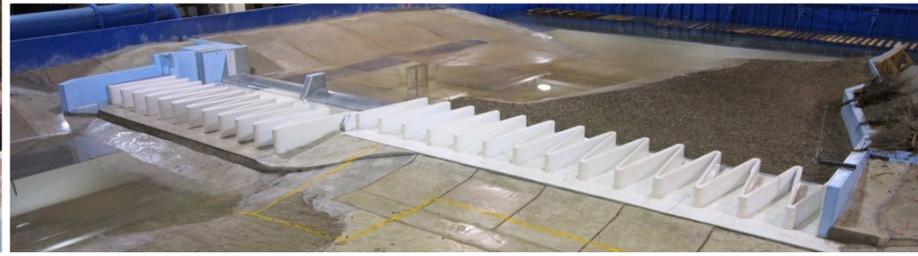
**LINEAR**



**LABYRINTH**



# PHYSICAL MODELING



# CURRENT LAKE BRAZOS DAM



# CONSTRUCTION

April 2006



October 2006



March 2007



April 2007



*Water Surface at Weir*

November 2007



# LAKE BRAZOS DAM

- Video of Lake Brazos Dam



The background of the slide features a blue-tinted photograph of a dam. The dam's spillway is visible, with several rows of concrete spillway gates. The water level is high, and a small boat is visible in the upper left corner. The overall scene is captured from an elevated perspective, showing the structure of the dam and the surrounding water.

# EMBANKMENT EVALUATION

# BACKGROUND

- 2004: Observations of steep slope and poor condition of sheetpile. Prepared stilling basin design.
- 2007: Flooding during construction damaged slope
- 2007: TCEQ recommended monitoring until permanent repair is implemented



# EMBANKMENT OVERVIEW



Embankment Section

Erosion

Sheet Pile System

Left Outlet Works

# DAM SAFETY INSPECTION

- 2014: Existing sheetpile condition noted to be worsening
- 2016: FNI evaluated the existing condition of the embankment and earth retaining system



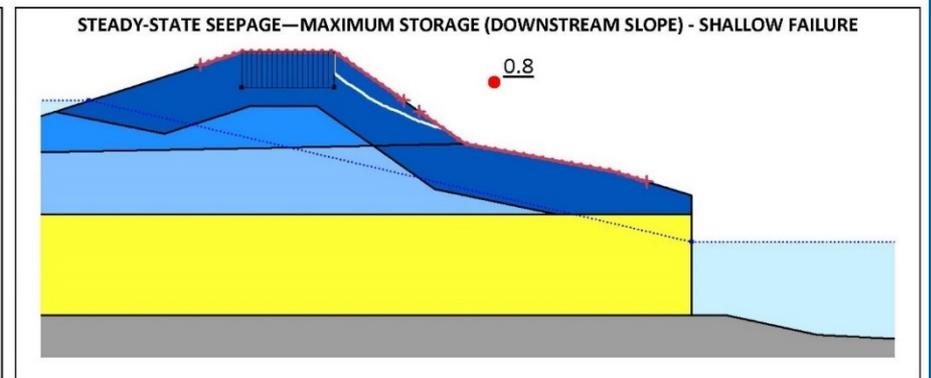
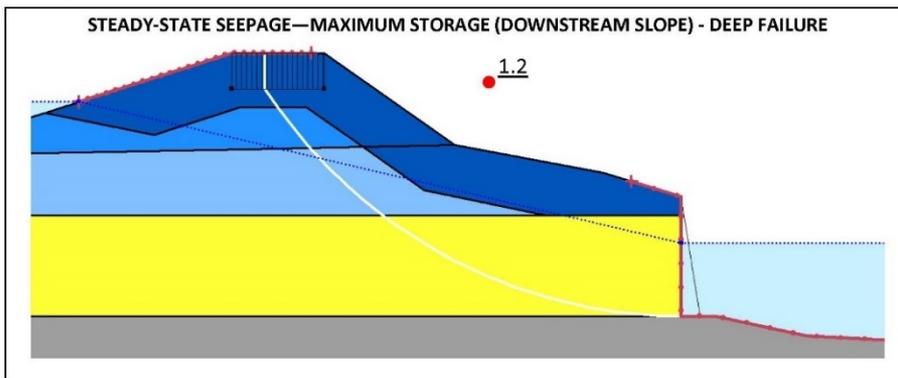
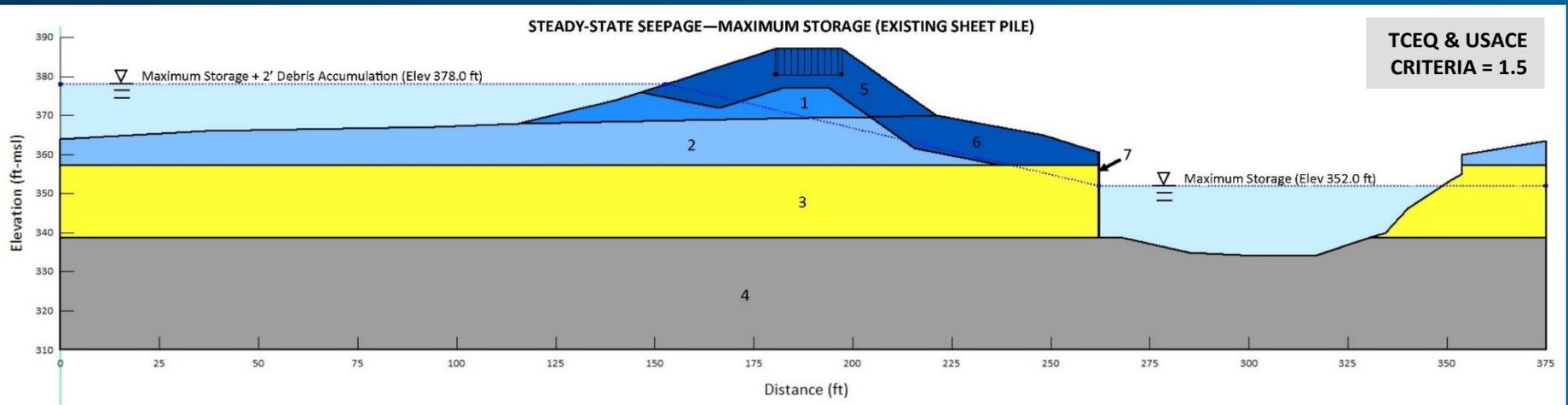
# TEMPORARY REPAIRS

- 2019: City made temporary repairs to the worsening condition (sinkhole) of the embankment toe



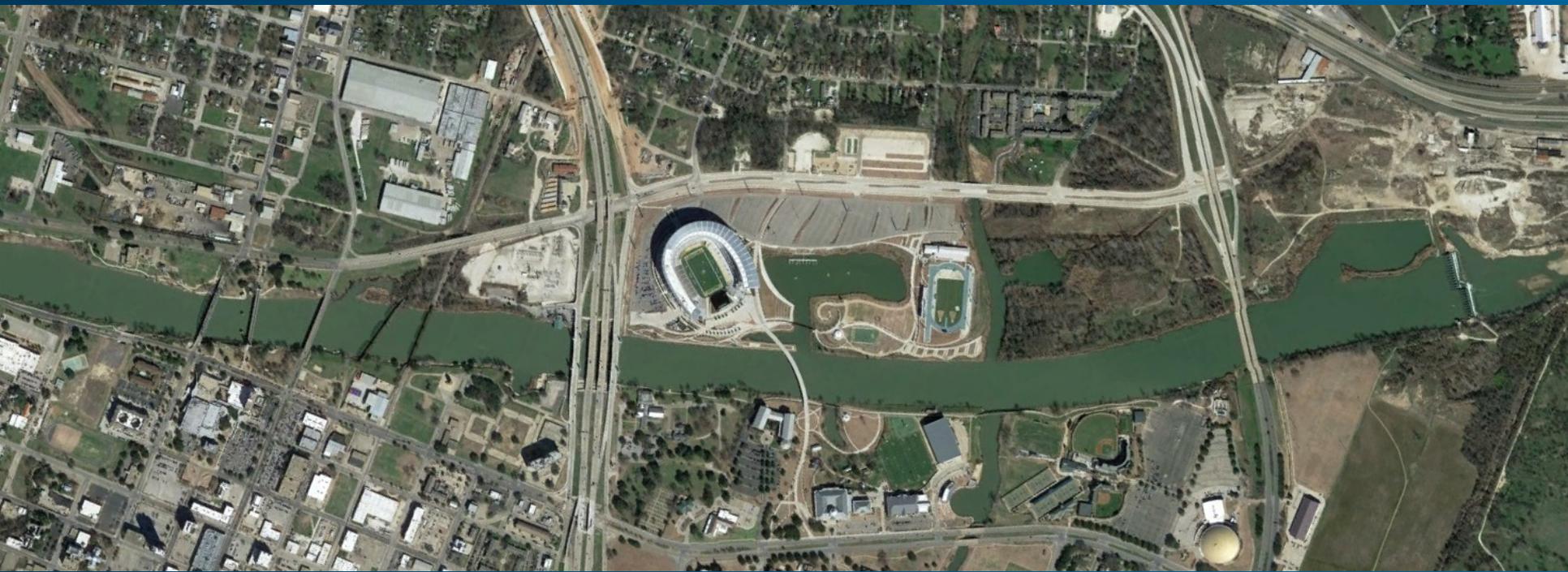
# EVALUATION

- Embankment downstream slope stability does not meet recommended safety factors



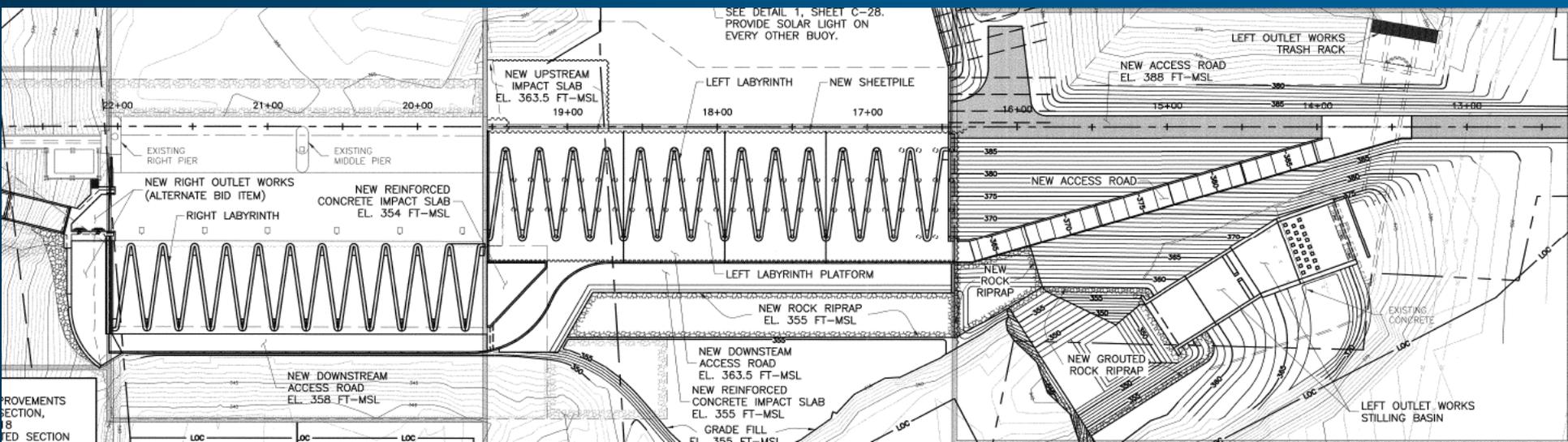
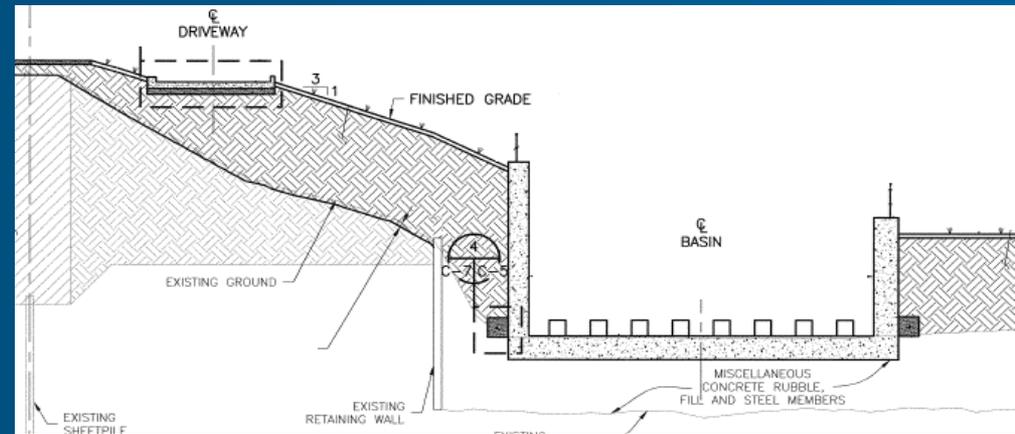
# RISK OF FAILURE

- *Significant risk* of failure of the embankment
- Failure would result in loss of the reservoir
  - Dam impounds the City's oldest water right
  - Amenity: Riverwalk and Baylor stadium



# RECOMMENDED SOLUTION

- Stilling Basin Addition
- Riprap Armoring
- Actuator Modifications
- Dewatering System Addition



# NEXT STEPS

## Embankment Stabilization and Improvement Project

1. Final Design
2. Coordination with City on Developer's Project
3. TCEQ, USACE, TPWS Permitting
4. Construction

