

BOARD BRIEFING - APRIL 18, 2017

On December 27, 2015, Lake Cypress Springs experienced a historic flooding event which resulted in record lake levels and significant damage to waterfront property.

> FCWD hired Carollo Engineers, Inc. to prepare and submit a Preliminary Engineering Report (PER) to determine a feasible solution to curtail flood events similar to the December 2015 event(s) (equivalent to a 350-year flood event)

The PER was completed and presented on March 6, 2017.

The PER studied the **hydraulic feasibility** of the alternatives proposed, **determined the requirements from various regulatory agencies**, and **outlined the costs** associated with each alternative evaluated. Additionally, the PER evaluated the benefit (dollar saved in damages) each alternative would have to the surrounding community in a large storm event. Initially five (5) baseline structural alternatives and a single (1) operational alternative (6 in total) were considered.

This list was then filtered from the original six (6) down to three (3) structural alternatives and a single (1) operational alternative.

- **1. ADDITION OF CANAL ON EMERGENCY SPILLWAY**
- 2. ADDITION OF BOX CULVERTS ON NORTH END OF LAKE CYPRESS SPRINGS (LCS) DAM
- 3. ADD TAINTER GATES TO LCS DAM (COMPARABLE TO LAKE BOB SANDLIN (LBS)
- 4. ADD PUMP STATION AT NORTH END OF LCS DAM
- 5. ADDITIONAL MORNING GLORY SPILLWAY
- 6. OPERATIONAL ALTERNATIVE





Building a Secondary Morning Glory



Alternatives Matrix

	Task Hurdle							
				Local Agency				
			Federal /	Approval		Minimal		
			State Agency	(Downstream		Impact to		
	Нус	Iraulic	Approval is	Stakeholders)	Cost	Water		
Alternative	Feasibility		Feasible	is Feasible	Feasibility	Supply		
1A								
1B								
1C		Legend						
2A		\checkmark	Carollo predicts FCWD's ability to hurdle the task					
2B			is feasible for specific alternative.					
2C			Carollo predicts FCWD's ability to hurdle the task					
3A		√ *	is feasible, however, cost feasibility and funding					
3B			options will be determined by the FCWD available					
3C			funds and policy decisions.					
6A			Carollo predicts FCWD would not be able to					
6B		×	hurdle the requirements for a specific alternative.					
6C			Feasibility of accomplishment is deemed low.					
6D								
6E								

Alternatives 3A, 3B, and 3C (Tainter Gates) appear to be the only viable alternatives for the District when evaluating the hydraulics, agency approval requirements, concurrence from downstream stakeholders, and impact to water supply.



FINALIZED Alternatives Matrix

	Task Hurdle						
				Local Agency			
			Federal /	Approval		Minimal	
			State Agency	(Downstream		Impact to	
	Hydraulic		Approval is	Stakeholders)	Cost	Water	
Alternative	Feasibility		Feasible	is Feasible	Feasibility	Supply	
1A	<u>v</u>		6		6	√	
1B			Legend			✓	
1C			Carollo predicts FCWD's ability to hurdle the task				
2A		√ *	is feasible, however, cost feasibility and funding				
2B			options will be determined by the FCWD available funds and policy decisions.				
20							
20							
5A	•		V	•	•	•	
3B	\checkmark		✓	✓	✓ *	✓	
3C	\checkmark		\checkmark	\checkmark	√ *	\checkmark	
6A			\checkmark	\checkmark	\checkmark	×	
6B			\checkmark	\checkmark	\checkmark	×	
6C			\checkmark	\checkmark	\checkmark	×	
6D			\checkmark	\checkmark	\checkmark	×	
6E			\checkmark	\checkmark	\checkmark	×	

Key Board-Decision Elements

Project	Storm	Property
Cost	Frequency (Risk)	Damages



Alternative 3 – Benefit Cost (BC) Ratio

			ALTERNATIVE 3		
			3A	3B	3C
Rain Event	Probability	Model Conditions	1 gates	2 gates	3 gates
		Impacts (\$)	Impacts (\$)	Impacts (\$)	Impacts (\$)
CAPITAL COSTS →			\$23.8 M	\$31.1 M	\$39.0 M
100-year	0.01000	\$347,890	\$38,402	\$19,706	\$16,104
350-Year	0.00285	\$2,910,117	\$120,175	\$32,749	\$19,706
500-Year	0.00200	\$3,495,949	\$174,235	\$36,353	\$21,790
	100-YR BC RATIO		1.30%	1.06%	0.85%
	350	O-YR BC-RATIO	11.73%*	9.26%	7.41%
	500	O-YR BC-RATIO	13.96%*	11.14%	8.91%

* IT TAKES OVER 7+ 500-YR EVENTS (OR 8.5+ DECEMBER 2015 EVENTS) TO BREAK

EVEN ON THE CAPITAL INVESTMENT OF THE 1-GATE PROJECT

Manager's Opinion

In my opinion, the capital costs required to implement Structural Alternative 3 (\$24M - \$39M), coupled with a Low BC-Ratio, warrants NO-ACTION from the District.

Additionally, the District has incurred Ancillary Option Costs (Regulation Modifications) that will support the effort of FCWD to curtail flooding damages.

Emergency Spillway

The Emergency Spillway is fixed at 385 feet MSL and is designed to relieve pressure on the Franklin County Dam only to prevent a catastrophic failure.

Water will start to flow out the Emergency Spillway if the lake level reaches that 385 feet MSL elevation. In addition to flood protection relief alternatives, the PER also included results of a field-survey comparison on the Emergency Spillway to the actually intended design.

> The results of this analysis show that the existing Emergency Spillway does exhibit, in most areas, an excess of fill above the designed ground elevation.

Emergency Spillway Elevation Comparison

Emergency Spillway Restoration Possibility



RESTORATION BY EXCAVATION

FILL SPOILS DEPOSIT AREA

ADDITIONAL H&H ANALYSIS REQUIRED TO DETERMINE FEASIBILITY

It is recommended by Carollo in the PER that the District, at a minimum, return the spillway to its original design and that **the District proceed with an investigation to analyze other restoration possibilities** to reduce costs. Scope-of-Work STEP 1
1. Do-Nothing for Baseline
2. Return Emergency Spillway to Design
3. Evaluation of Alternative Restoration

Scope-of-Work STEP 2

A. 2D Model Development

Example of 2D Model Results Showing:

- Velocities
- Water Surface Elevation
- Maximum Conveyance



- C. Cost Estimate
- D. Benefit-Cost (BC) Ratio

Manager's Opinion

In my opinion, the District should authorize Carollo Engineers, Inc. to perform the necessary hydraulic analysis per the presented scope of work to determine the alternatives available to the District

Audience Questions and Answers