Fort Smith
Regional Water Supply Project Update

Summer 2001

Highlights:

- The purpose of the spillways is to convey water safely past the dam into Frog Bayou.
- Principal spillway will be a concrete structure consisting of a weir, culvert, chute, and stilling basin.
- The auxiliary spillway will be a 410-foot-wide cut in the rock around the west abutment of the new dam.
- The southeastern end of the Ozark Highlands Trail will be relocated to the new Lake Fort Smith State Park.

Getting Water Out of the Lake 2: The Spillways

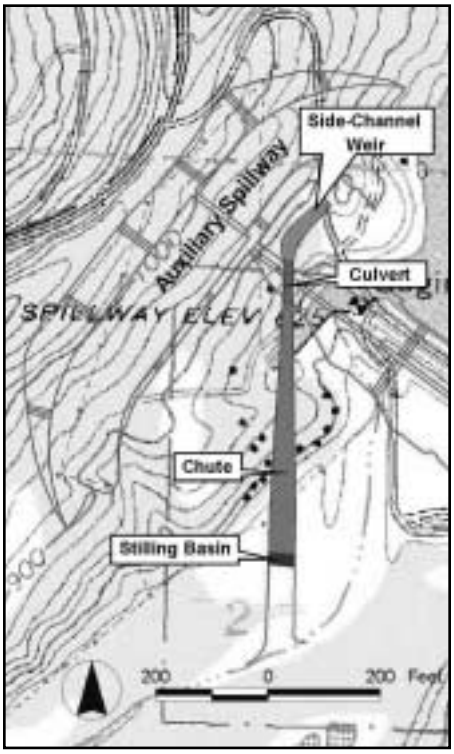
The primary purpose of the enlarged Lake Fort Smith is to provide additional water for the city of Fort Smith's regional water supply system. Frequently, however, more water will enter the lake than can be used by the treatment plant or released to maintain minimum flow in Frog Bayou via the outlet works. This "excess" water will exit the lake through two spillways. The function of the principal and auxiliary spillways is to convey water safely past the dam.

The principal spillway will be designed to pass flows up to the 100-year flood safely and without causing damage to the dam or spillway. Because water will flow frequently through the principal spillway, much of the spillway design is dictated by the need to minimize and resist the erosive force of flowing water and safely dissipate the energy in the system.

The principal spillway will consist of four major sections. From upstream to downstream, these sections are the weir, the culvert, the chute, and the stilling basin. The weir is a 250-foot-long[1], 25-foot-deep concrete trough built on bedrock along the bank of the new lake, just upstream from the dam's west abutment. Water will flow over the weir on one side of the trough; thus this structure is referred to as a side-channel weir. The crest of the weir will be at an elevation of 911 feet. The bottom of the trough will be about 20.5 feet wide at the upstream end and about 45.5 feet at the downstream end. The trough widens to minimize the velocity of water flowing out of the trough.

Water collected in the trough will flow through a 122-foot-long channel, which curves to the east 38 degrees, then into a culvert that will pass under the dam. Because the culvert is near the west dam abutment, the dam will be about 50 feet high at this point. The culvert will consist of four 258-foot-long rectangular concrete tubes. Each tube is approximately 12 feet wide. The mouth of each tube is 22 feet high. Just 21 feet down from the mouth, however, the tubes narrow to about 16.5 feet high. The discharge ends of the tubes are 12.1 feet high. The tubes narrow to prevent "slug flows" similar to what happens when water is poured rapidly out of a bottle

[1]All spillway dimensions are preliminary.



Preliminary spillway designs for the new Lake Fort Smith.

with a small opening. Slug flows can cause vibrations that could damage the culvert. The floor of the culvert will have a downward slope of about 0.5 inch for every foot of length.

The culvert will discharge into a 1,312-foot-long concrete chute, which will angle down the west abutment to the valley floor. The chute will be 55.5 feet wide at the top and 152 feet wide at the bottom. The chute will vary in depth from 16 feet at the culvert to 11 feet just above the stilling basin. The chute will slope down about 1 inch per foot of length.

Water flowing down the chute has the potential to reach considerable velocities. At the 100-year flood event, approximately 18,700 cubic feet per second of water would flow down the chute at speeds up to 44 miles per hour. If these velocities were not controlled, damage could occur to Frog Bayou. The velocities will be reduced to an acceptable level with a 120-foot-long, 152-foot-wide stilling basin at the end of the chute. Water will drop 22.5 feet into the stilling basin down a concave, 93.7-foot-long extension of the chute. This drop will create a standing wave of water in the basin, which will dissipate much of the water's velocity. From the stilling basin, water would flow the rest of the way to Frog Bayou through a rock-lined channel. The entire principal spillway will be approximately 2,500 feet long.

Discharges from the new Lake Fort Smith in excess of the 100-year flood flow will pass through the auxiliary spillway. This spillway will resemble the current spillway but will be much larger. The new one will be a 410-foot-wide, unlined channel cut into rock around the west abutment of the dam with a crest at an elevation of 918.5 feet. Approximately 4,750,000 cubic yards of rock will be removed to create the channel. This rock will be used in the construction of the dam. The cut for the spillway will come within approximately 100 feet of U.S. Highway 71. The distance from the lake, through the auxiliary spillway to Frog Bayou will be approximately 4,500 feet. The primary and auxiliary spillways are both called uncontrolled spillways because no active operation, such as opening valves or moving gates, is required to maintain water level in the lake. This arrangement was chosen to simplify operation of the lake.

New Head for Ozark Highlands Trail

The new dam will cause the closure of the existing Lake Fort Smith State Park. This park contains the southeastern end of the Ozark Highlands Trail (OHT). The OHT is a 187-mile National Recreation Trail that runs from Lake Fort Smith Park to the Buffalo River at the Tyler Bend Recreation area in Missouri. The trail is managed by the U.S. Forest Service and maintained by the Ozark Highlands Trail Association.

During construction of the new dam and state park, the segment of the trail between Lake Fort Smith State Park and the next access point, near White Rock, will probably be closed. A new trail head will be incorporated into the new state park. A new trail segment will be blazed around the north end of Lake Shepherd Springs, which will connect with the existing trail near Jack Creek on the east side of Lake Shepherd Springs. The location of the replacement trail segment will be determined through coordination among the Forest Service, the Ozark Highlands Trail Association, the Arkansas Department of Parks and Tourism, and the City of Fort Smith.

The City of Fort Smith ARKANSAS

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