Construction of the Duck River Reservoir
62nd Annual Alabama Transportation Conference

Background

- Project was for the Cullman Utilities Board
- Cullman is ranked 5th in the United States among “Micropolitan Areas” for Economic Development – #1 in Alabama for agriculture
- Cullman Utilities Board is a regional supplier of drinking water
  - Owns a source water reservoir
  - Owns the Cullman Water Plant – 24 MGD
- Lake Catoma is the sole source of raw water

Planning and Permitting

- Project planning began in the mid-1990s
- Initial engineering investigations and designs were completed by the USACE
- Original FONSI and CWA Section 404 permit issued in 2000
- The Court ruled that the USACE did not take a “hard look” at 3 issues – vacated the permit and remanded it back to the USACE for Further Review
- Additional studies and Supplemental Environmental Assessment completed by CH2M HILL
- New FONSI and 404 permit issued in 2006

Need for a Sustainable Water Supply

- Maintain Lake Catoma as the main source of water
- Duck River Reservoir is needed to meet the following water needs of the community:
  - Emergency situations (spills, drought, etc.)
  - Future water supply for growth
- Same geologic ecosystem
- Water from the Duck River Reservoir is compatible with Lake Catoma
- Opportunity for Optimizing Raw Water Supply from the two sources
Need for a Sustainable Water Supply

- Initially, the USACE was the designer
- CH2M HILL became the Engineer-of-Record in 2011
- Duck River Dam is a hybrid dam:
  - Roller-Compacted Concrete (RCC) Spillway
  - Rockfill Embankments
- 2,300 feet long, 135 feet at the deepest location
- 640 acre reservoir

Site Investigations and Studies

- 1998 USACE Exploration (70+ core boring, packer testing and limited rock strength testing)
- 2011 & 2012 Investigations
  - 8 Rock Cores borings with Video logging within dam footprint
  - 10 Rock Core boring within the Rock Quarry footprint
  - Laboratory Test of Rock and Soil Specimens
  - Packer Testing
  - Significant Excavation in the dam foundation
  - Grout Test Program
  - Aggregate Source identification
  - Trial RCC Test Mixing
  - Piezometer Installations
  - Geologic Mapping
Phase I Geologic Investigation

Site Specific Geology

Raise Two 500 kV Towers 100 feet

Embankment Cross Section at Abutments
**Foundation Treatment**

Over Excavation

**Shotcrete Treatment**

**Construction Traffic Concerns**

**Quantities – Borrow and Overburden Excavation**

- On-site Clay Borrow – 160,000 cubic yards+
- Quarry Rock Excavation – 800,000 cubic yards
- Overburden Excavation – 950,000 cubic yards
  - Overburden material remained on-site
  - Used a fill to provide a work platform for the concrete batch plants and aggregate processing and storage

**Embankment Clay and Rock Quantities**

- Zone 1 (clay core) – 160,000 cubic yards
- Zone 2A/2B (armor face) – 58,500 cubic yards
- Zone 3A/3B (rock fill shells) – 503,000 cubic yards
- Zone 4A & 4B (filter & drain) – 107,000 cubic yards

Except for Zone 4A & 4B material, all rock needed for the project was obtained, processed and stockpiled on-site

**Confirm Clay Volume and Permeability**

**Clay Stockpile**
Clay Stockpile

RCC Spillway Section

Quantities – RCC Spillway and Water Intake Structure
- RCC – 160,000 cubic yards
- Foundation Concrete – 5,500 cubic yards
- Structure Concrete – 6,500 cubic yards

Aggregate for RCC and Conventional Concrete was obtained, processed and stockpiled on-site

Excavation at Quarry (Rock Borrow)

Crushed Aggregate Stock Pile Area
Embankment Cross Section at Abutments

Left Abutment -- Sand & Gravel Filter/Drain Placement

Left Embankment

Embankment Zones

RCC Test Pad
RCC Batching and Conveyance

RCC and Conventional Concrete Batch Plants

RCC Conveyance
Water Intake Screens

Water Diversion for Minimum Release Compliance

HDPE Diversion Pipe over the Right Embankment

Minimum Downstream Release

100-year Flood Event on Christmas Day 2015

Christmas Day 2015