

PROJECT PROFILE

INVESTIGATION/REMEDICATION OF SEEPAGE CONDITIONS AT EAST BRANCH DAM

D'Appolonia performed a comprehensive geotechnical exploration at the East Branch Dam located on the East Branch of the Clarion River in Elk County, Pennsylvania, for the Pittsburgh District of the U.S. Army Corps of Engineers (USACE).

East Branch Dam is a compacted earth-fill structure with the primary spillway tunnel passing beneath the right abutment and the emergency spillway channel cutting through the left abutment and adjacent hillside. The dam was designed to have a central core zone and cutoff trench, but, as constructed, is generally homogeneous in nature.



Drilling operations at East Branch Dam.

In 1957 a cavity formed in the right side of the dam near the centerline, and emergency grouting was subsequently performed to fill the void. The dam has not experienced another emergency incident since 1957, but in recent years high piezometric levels have been observed in the right side of the dam and at other locations. Emergency measures such as lowering the reservoir level, performing 24-hour visual reconnaissance of the dam, and staging of construction materials have been employed at the dam site.

D'Appolonia's site exploration work at East Branch Dam has included:

- A geophysical study using Willowstick Technologies AquaTrack™ methodology to identify preferred seepage paths through the dam.
- Conventional borings, sonic-drilled borings and cone penetration test

(CPT) soundings through the dam embankment, right abutment and native foundation materials.

- Water pressure testing in selected boreholes.
- Rehabilitation of existing piezometers and installation of new ones.

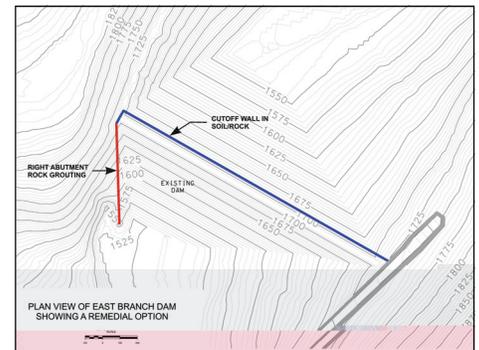
Working with Pittsburgh District USACE personnel, the project team identified three primary potential failure modes for the dam:

1. Piping of embankment soil into fractured foundation rock or the rock toe drain at the location of the 1957 void.
2. Piping of embankment soil into fractured foundation rock or the rock toe drain at any point along the right abutment.
3. Piping of embankment soil in foundation soil and/or rock at the left abutment.

Several potential risk reduction measures have been considered including installation of cutoff/diaphragm walls, grouting of abutment rock, improving internal dam drainage, and buttressing of the dam.

Based on the three identified potential failure modes and the risk reduction measures that were determined, several alternative risk reduction plans were identified, including the following:

- Partial-length cutoff wall with grout curtain in bedrock
- Full-length cutoff wall with grout curtain in bedrock
- Upstream slope seepage barrier with upstream foundation cutoff
- Dam extension and fortification
- Operation at reduced maximum summer pool
- Complete removal of the existing dam



Plan drawing showing a proposed alternative for remediation of seepage conditions at East Branch Dam.

For each of the considered alternatives, the estimated construction quantities, anticipated schedule requirement, and advantages and disadvantages were determined for comparison purposes. The USACE Pittsburgh District is currently conducting an internal evaluation of the alternatives in order to determine which of the proposed remedial alternatives will be implemented.



Aerial photograph of East Branch Dam.