Project Description

Background

Crystal Lake Dam was reportedly originally constructed in 1930 and is located approximately 400 feet from Lake Street along a Tennessee Gas Pipeline Company utility easement. The dam is an approximately 250 foot long earth embankment and concrete and stone masonry dam with a primary spillway. The dam has a reported structural height of 8 feet. The dam is located at the east end of the lake. A concrete primary spillway discharges to an open channel and wetland area. There is no low-level outlet pipe through the dam.

The primary spillway is an 11.3 foot long concrete broad-crested weir with a breadth of 1.2 feet. The left training wall is a stone masonry wall. The right training wall is a stone masonry and concrete wall. The weir is fixed and uncontrolled. Downstream of the weir is a concrete splash pad that extends approximately 17 feet downstream.

The following deficiencies have been observed during previous inspections.:

- Seepage through the stone masonry and concrete structure has been observed and estimated in the at 0.5 to 1 gpm range.
- Combined foundation seepage flows have been estimated to be 2 to 3 gpm.
- The primary spillway was blocked with 6 inch diameter logs and debris.
- Continued deterioration of the auxiliary spillway crest was noted.
- A small sinkhole/erosion hole, approximately 16 inches deep was noted up-gradient of the standing water at the downstream toe of the dam.
- The splash-pad is broken near the toe of the downstream slope. The channel at this location plunges approximately 3 feet into an eroded stone lined channel off the broken edge of the splash-pad. It appears a portion of the concrete splash-pad has been displaced downstream.
- A rutted ATV trail was observed in the downstream area of the dam along the gas pipeline alignment.
- The dam has inadequate freeboard even at normal pool levels and cannot safely pass the SDF.
- General deterioration (cracking, spalling and crumbling) of the stone masonry and concrete structure to the right of the primary spillway has been observed.
- The dam is covered with trees and brush.

The dam rehabilitation project is being proposed to address the above-mentioned deficiencies.

Construction Sequence

Work will begin with defining the limit of work and installing erosion control measures as specified on the project drawings. To access the dam, a permanent access road, including permanent intermittent stream crossing, will be created from Lake Street, running parallel, and north, of the existing gas easement.

Rehabilitation work includes but is not limited to the following items.

- Cut the brush and trees to ground surface on all portions of the dam and to at least 20 ft. downstream of the dam and remove them from the site. Inspect the embankment after clearing the vegetation for deficiencies that were not observed during this inspection due to vegetation cover.
- Armor the downstream channel banks to prevent erosion and scarp formation.
- Monitor and as required, repair the cracks and spalls on the concrete and mortared stone masonry covered embankment to the right of the spillway.
- Remove the root systems of all trees greater than four inches in diameter that were cut as part of routine maintenance. Fill voids with compacted granular fill.
- Raise/regrade the crest level of the embankments to provide a minimum of one foot of freeboard during the SDF. Form the embankment sideslopes/walls to uniform stable grades and install appropriate slope protection and drainage features.
- Repair/replace the spillway training walls as part of the embankment improvements.
- Repair/replace the cracked and broken discharge channel splash pad.
- Install a mineral toe drain along the base of the downstream concrete and mortared stone masonry wall right of the spillway to control seepage water. Armor the downstream area of the wall to prevent damage from overtopping.

Environmental Impacts

Rehabilitation efforts of Crystal Lake Dam will bring the dam into compliance with current Massachusetts dam safety regulations. The duration of the proposed rehabilitation work will likely be on the order of several months. The project has been designed to limit adverse impacts to the wetland resource areas as much as practicable.

Wetland resource areas affected by this project will be Land Under Water (LUW), 100-year flood zone, and Bank.

A total area of 1,935 square feet (sf) of land under water (LUW) will be impacted due to the placement of the reinforcing wall along the upstream bank of the dam. There will be no material removed/dredged from LUW. The vast majority of these impacts will be temporary in nature having to do with area to move around in during construction.

Impacts to the 100-year flood zone are related to bank stabilization and bank re-grading efforts along the downstream slope of the project. It is anticipated that there will be net of 10 cubic feet of flood storage gained in the flood zone.

An estimated 37 linear feet of bank associated with the unnamed intermittent stream to the east of the dam will be impacted due to the placement of the stream crossing construction. An additional 10 feet of bank will be impacted on the east side of the dam. In all, 47 linear feet of bank will be impacted.

For erosion and sediment control, all work areas adjacent to wetland resource areas will be lined with silt socks. The silt socks will be inspected daily and accumulated silt will be removed as appropriate.