

Spillway Repairs at Coes Reservoir Dam -Worcester, Massachusetts

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Coes Reservoir Dam is a high hazard dam in the City of Worcester, Massachusetts. The approximately 700 ft. long, 20 ft. tall earth embankment dam was constructed in 1865 to provide power for a factory complex manufacturing wrenches and knives into the 1990s. Following demolition of factory structures in the late 1990s, Coes Reservoir Dam was left in poor condition and was rehabilitated in 2006. Dam rehabilitation consisted of embankment improvements including slope modifications and overtopping protection, low-level outlet (LLO) construction, enlargement of the primary spillway and discharge channel, installation of a pedestrian bridge over the spillway, environmental remediation of contaminated materials, and wetland replication. Portions of the spillway discharge channel expanded as part of the 2006 rehabilitation were lined with mats of articulated concrete blocks (ACBs). The grouted riprap lining of the original spillway channel remained in-place. In the years following the rehabilitation, upward bulging of the ACB mats was observed at the downstream end of the ACB armoring. The ACB mats were eventually compromised and an erosion gully began to form at the downstream end of the spillway discharge channel. In the spring of 2019, the gully was approximately 8 feet deep, 15 feet wide, and had progressed upstream to within approximately 60 feet of the primary spillway weir. The dam was assigned a rating of 'Unsafe' by the Massachusetts Office of Dam Safety. Design of spillway repairs included an investigation into potential causes of the failure and evaluation of several repair alternatives. Review of photographs, as-built drawings, existing conditions, and technical literature suggested that the bulging at the downstream end of the ACB mats was likely caused by excess hydraulic pressure in the bedding layer beneath the ACB mat, especially in the area of the hydraulic jump near the end of the discharge channel. The selected repair alternative included replacement of the intact ACBs in the upstream portions of the discharge channel above the hydraulic jump. A larger block size was selected to provide increased stability and resistance to impact damage and an updated bedding layer detail was employed to increase drainage through the blocks and underlying bedding layer. Downstream portions of the spillway discharge channel were lined with large grouted riprap. Spillway repairs included reservoir drawdown, flow bypass through the work area, management of environmentally impacted sediment, and associated permitting. Repairs are scheduled to be complete by spring 2020.