

Pipestem Dam Spillway Modification

Jamestown, North Dakota, USA

To protect the Pipestem Dam, Keller installed a dewatering solution to stabilize the spillway.



The project

Pipestem Dam and reservoir were completed in 1973 and are owned, operated, and maintained by the US Army Corps of Engineers. The dam includes an earthen embankment with a gated outlet structure and an earthen spillway. After a flooding event on a nearby dam, it was determined that, should a similar event occur at the Pipestem Dam, the highly erodible soils in the earthen spillway would present a high risk of spillway erosion, which may lead to a spillway breach and uncontrolled release of water, and mitigation was necessary.

The challenge

The spillway structure contained a combination of natural and placed erodible soils overlying highly weathered shale. High static groundwater levels in parts of the spillway structure were only a few feet below the ground surface. After an in-depth evaluation, the US Army Corps of Engineers determined that the erodible soils needed to be removed and then backfilled with suitable compacted materials, on which a roller-compacted concrete (RCC) structure would be built.

The solution

Keller was contracted to install a dewatering system to lower the groundwater within the spillway structure below the excavation subgrades. This would facilitate the excavation of the erodible soils and backfill and the construction of the RCC structure.

Keller's dewatering system included installing 81 deep wells around the perimeter of the planned excavation area. Well depths extended to the bedrock interface, between 35 ft and 50 ft deep. Additionally, well points were installed along the toe of the spillway to facilitate the excavation and construction of the concrete stilling basin structure. Wellpoints were also installed along the excavated embankment to handle localized seepage.

All boreholes were drilled using dry sonic methods and were cased through the overburden to the rock. Several pump tests were performed early in the project to validate the initial dewatering design parameters. This allowed the design to be modified as installation work was ongoing without delaying the project.

During dewatering operations, data was collected daily from piezometers (an instrument used to measure fluid pressure) and inclinometers (an instrument used for measuring angles of slope/tilt and elevation of an object for gravity) to verify system efficiency. Peak flow rates from the dewatering system exceeded 500 gpm (gallons per minute). Well fouling was observed during operation, requiring a large portion of the wells to be treated to improve performance.

After dewatering, all the wells and well points were filled with cement and left in place.

Project facts

Owner(s) US Army Corps of Engineers

Keller business unit(s) Keller

Main contractor(s) Barnard Construction Company, Inc

Engineer(s) US Army Corps of Engineers Solutions Groundwater control and dewatering

Markets Infrastructure Dams and levees

Techniques Dewatering

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