

## **Researching Optimal Grout Mixes Using Large Scale Laboratory Testing for Logan Martin Dam**

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Logan Martin Dam is a hydroelectric facility owned and operated by Alabama Power Company (APC) on the Upper Coosa River in Vincent, AL. Construction of the dam was initiated on July 18, 1960 and was placed in service on August 19, 1964. Seepage through the karstic dolomite foundation began in 1964 immediately after reservoir filling. The seepage produced numerous springs and boils in the river channel, along the downstream riverbanks and eventually at the toe of the east embankment. After a sinkhole developed near the crest of the downstream face of the east embankment on April 9, 1968, the first of the remedial grouting programs began at Logan Martin, and APC has continued in-house grouting operations ever since. As a result of the years of several overlapping programs of grouting since the 1960's, experience gained from Logan Martin Dam has resulted in significant advances in the understanding of and techniques for treatment of karst foundations at dam sites. And, even though APC has made significant improvements in dam safety as a result of the grouting program there remains the constant goal to develop the most effective grout mixes for this karstic foundation. In 2017 APC partnered with Alden Laboratories of Holden, MA to conduct a groundbreaking research program that tests the effectiveness of typical and experimental grout mix designs. A key component of the test program was the development of a state-of-the-art grout test chamber. Common industry grout testing practices typically include small-scale, "table-top" tests and models that do not address actual field conditions (e.g., Marsh Funnel, Pressure Filtration, etc.). The test chamber is comprised of three (3) sections each 3ft x 3ft x 10ft. The size of the chamber allows a wide range of setup possibilities that can simulate the unique geologic and hydraulic conditions of Logan Martin Dam at an unprecedented scale. It is a unique approach by a dam owner to independently research and develop innovative methods for enhancing dam safety. This paper will present how the test chamber has proven to be a useful tool for evaluating the performance of grout mix designs used in previous grouting programs and develop effective mix designs for future grouting programs both at Logan Martin Dam and industry wide.