Geocomp

Technologies to manage risk for infrastructure

Project Brief

Willow Island Hydroelectric Project

Client:

American Municipal Power, Inc.

Location:

Pleasants County, WV

Services Provided:

- Real-time monitoring
- Engineering services during design and construction

Value Provided:

- Real-time performance monitoring provides essential data for warning of deformation / movement
- Performed direct shear tests on rock samples with slickensided joints
- Evaluated stability of rock cuts under a range of piezometric conditions associated with flooding of the Ohio River
- Performed block analysis to assess the stability of a large, potentially unstable rock block formed by the intersection of a fault and the excavation
- Used 2D and 3D finite element analyses to determine design loads for stabilizing rock anchors

Background & Project Challenges

Willow Island Lock and Dam was constructed in the 1970's as part of a series of lock's dams along the Ohio River. The site has been considered a prime location for a hydroelectric plant for the last two decades. American Municipal Power Inc., as part of four separate hydro projects, has begun construction on the 35-MW Willow Island Hydroelectric Project. The project will divert water from locks and dam through two horizontal 22-MW bulb turbines to generate power.

Geocomp Role & Accomplishments

Geocomp provided real-time monitoring and warning system for construction of water retention cofferdam structure and deep excavation. The construction of the hydroelectric project was conducted in two phases: construction of the cofferdam to encircle the project site, and construction of the powerhouse. The cofferdam will consist of multiple, interconnected cells of backfilled steel sheeting on the river side of the cofferdam, and a soil-bentonite slurry cut-off wall on the landward side of the cofferdam. The cofferdam extends to the top of rock to provide a cut-off for infiltrating water into the planned excavation for the powerhouse. The excavation was made through medium dense to loose sands and gravels and soft to stiff silts and clays and through approximately 60-ft of various soft rock, including sandstones, siltstones, claystones, shales, which is highly jointed, contains slickensides (previous shear planes), and high angle discontinuities. These existing conditions posed the threat of instability of the excavated soil slopes and the rock cuts during excavation for construction of the powerhouse.

Geocomp also provided engineering services during design and construction of the 2,400-ft-long cofferdam and 100-ft-deep excavation for future construction of a new hydroelectric powerhouse. Geocomp provided real-time web-based monitoring and warning system that was used during excavation for the powerhouse for measurement of settlement, horizontal displacement, pore pressures, and tilt of the existing piers and/or the planned construction.

The geotechnical instrumentation program was critical to monitoring the behavior of the soil slopes and the rock cut during excavation for the powerhouse. Measurements of settlement and horizontal displacement of the cofferdam around the perimeter of the excavation, pore pressures in the subsurface, and tilt of the existing dam structures provided confidence in our engineering predictions of slope movements and stability and provided warning of unanticipated movements.