

PROJECT PROFILE

VALUE STUDY AND DESIGN SERVICES FOR KENTUCKY LOCK ADDITION PROJECT

D'Appolonia had lead responsibility for geotechnical aspects related to construction of the Downstream Cofferdam for the Kentucky Lock Addition project. The site was characterized by unusually hard and abrasive limestone (average unconfined strength = 28,000 psi) that had a highly irregular surface profile due to variable weathering and major solution features. The bedrock posed significant excavation and seepage control challenges.

As part of the evaluation of value engineering (VE) alternatives, D'Appolonia analyzed and developed construction costs for pre-defined alternatives, while also formulating innovative approaches to integrating the very hard bedrock with the cofferdam and future lock monoliths to substantially reduce rock excavation and concrete quantities. During the on-going Final Design stage, D'Appolonia:

- Characterized rock properties, and developed a three-dimensional model of the subsurface conditions.



Conceptual aerial view of Kentucky Lock Project.

- Performed rock mechanics stability analyses of planned cuts and the global stability of the cofferdam-rock combination, accounting for seepage pressures and prominent discontinuities in the rock mass.
- Evaluated in-the-wet rock excavation techniques (blasting, and milling, drilling, and other mechanical methods) and designed an underwater blasting plan.
- Prepared a report on underwater blasting, special blasting considerations, potential impacts to existing structures and aquatic life, and mitigative measures.
- Performed finite element analyses to evaluate seepage pressures, and define seepage control and dewatering requirements.
- Performed engineering analyses and designed cost-effective methods to integrate the cofferdam with the bedrock and to support excavations below the cofferdam.
- Performed embankment slope stability analyses and developed optimized haul road stabilization measures as part of planning measures for the disposal for up to two million cubic yards of excess excavated material.



Downstream entrance to lock chamber at Kentucky Lock.