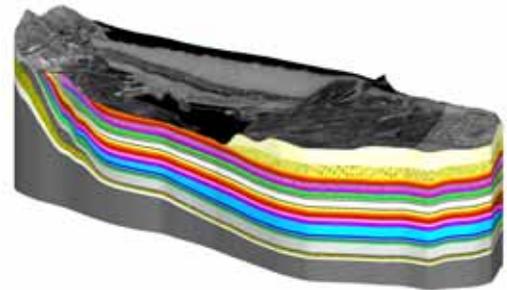




Hydrogeology and 3-D Visualization of Dam Foundations and Abutments

Description

Corps of Engineers' dams are challenged to perform beyond their intended service life, with increased risk to people and property downstream. In particular, dams on limestone or other geologic materials susceptible to dissolution have critical needs for sub-surface retrofit and repair. Historical information about foundation conditions is often in paper format only, and does not capture current conditions because of sub-surface changes due to grouting, compaction, and dissolution. Corps Districts need digital tools to define, visualize, and model changing conditions of dam foundations and abutments. These tools are needed to identify areas at greatest risk and to plan and document the effects of foundation grouting and other remedial activities.



3D Geologic Conceptual Model

Capabilities

The ERDC Hydrogeology and Groundwater Modeling Team builds site-specific modeling and visualization tools based on a detailed regional geologic setting and its engineering implications. Digital or historic nondigital data are geo-referenced using a geographic information system (GIS). The three-dimensional (3-D) geologic conceptual model is built using the Department of Defense Groundwater Modeling System (GMS). The conceptual model can be refined continuously to incorporate new data including borings, seepage rates, piezometers, water quality, or other parameters critical to understanding changes in the foundation. GMS is then used to identify flow pathways and display changes with time.

The ERDC team designs customized training based on the regional geology and hydrogeology of a specific dam. The training includes hands-on instruction in the maintenance and operation of project-specific geologic conceptual and hydrogeologic models, and provides reachback technical assistance on use of the conceptualization and modeling tools.

Benefits

The 3-D modeling and visualization tools can be used to identify areas of the foundation and abutments with historic or current high grout takes or high permeability. These tools also can be used to visualize foundation changes with time due to grouting operations, dissolution, or other processes. Data exchange between the modeling tools and onboard software of enhanced grouting tools, such as IntelliGrout[®], also is possible.

Success Stories

Since June 2006, the ERDC Mosul Dam Support Team has transformed scores of historic paper documents into a geologic conceptual model and hydrogeologic model. In November 2006, the ERDC team transitioned a site-specific geologic conceptual model to Gannett Fleming, Inc., for an application of IntelliGrout[®] at Mosul Dam, Iraq.

The ERDC team is transitioning the tools to the Mosul Dam staff through a hands-on workshop that includes instruction in the geologic setting, its engineering implications, and use of the project GIS and the GMS. This highly successful coupling of a hydro-geologic conceptual model and 3-D groundwater flow model of the Mosul Dam foundation and abutments represents a unique and novel approach to dam rehabilitation and is among the most detailed geologic conceptual models ever built using the GMS platform.

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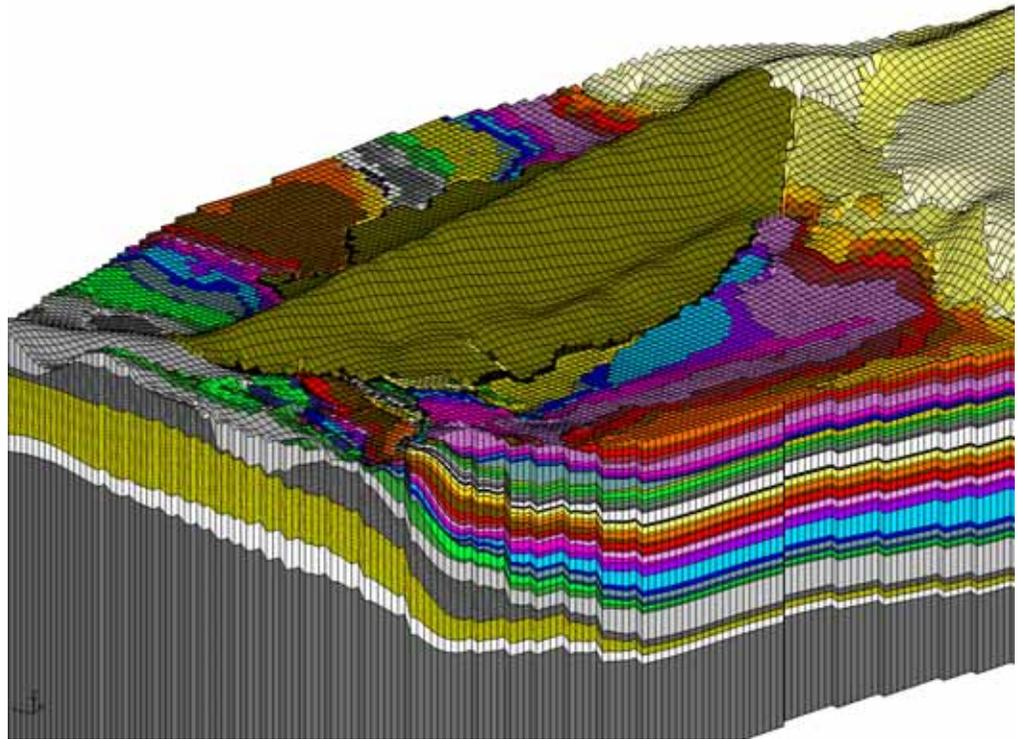
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3D Hydrogeologic Flow Model