PHOTO: MORMON ISLAND AUXILIARY DAM NEAR FOLSOM, CALIF., COURTESY OF MALCOLM DRILLING

Underground III

Safe and Sound Foundations

Advances in tunnel, trench and other underground solutions

By Vicki Speed

What's Inside

Shoring Up Miami Children's Hospital Bed Tower Expansion Project

Groundforce hydraulic struts support sheet pile shoring system, providing safety to project teams.

As part of the construction of the six-story Critical Care Bed Tower expansion at Miami Children's Hospital, Tropic Mechanical needed to construct a new underground utility vault to connect the tower with the central plant. The plant provides the facility with utilities such as chilled water, electricity and steam.

The vault and connection site is located immediately adjacent to the hospital's office/administration building (within three feet of the excavation). The soil is sandy with a C-60 classification. To support the utility upgrade, the contractor needed to excavate the entire 30-ft x 100-ft area to depths that ranged from 10-ft to 16-ft.

In addition to limited room, other challenges included the discovery of previously unidentified crossing utilities and a five-month window to complete the project. Tropic Mechanical teamed with United Rentals Trench Safety to develop an underground shoring system that satisfied all of these considerations.

Following a site evaluation and needs assessment, United Rentals Trench Safety specified and engineered a sheet pile shoring system supported by Groundforce® hydraulic struts. The shored area consisted of two three-sided pits (total 100-ft x 30-ft area). The shoring system was put in place quickly, allowing the Tropic Mechanical team to work safely in the pits.

The utility vault project is scheduled for completion this month. ■

The Seismic Rehabilitation of the Mormon Island Auxiliary Dam Key-Block

Mormon Island Auxiliary Dam (MIAD) near Folsom, Calif., is a zoned earthfill embankment dam that was completed in 1953 as part of federal Central Valley Project water management scheme. Studies by the Bureau of Reclamation indicate that MIAD has a high seismic risk associated with foundation liquefaction leading to embankment failure.

Upgrades were performed using in-situ soil improvement techniques over 10 years ago, however more recent studies concluded that the seismic risk remained at an unacceptable level. In response, the Bureau of Reclamation designed a downstream key-block with fill overlay. The key-block consists of a mass of lean concrete founded on moderately weathered bedrock and overlain by structural backfill built at the toe of the dam.

Constructing a secant piling system for Mormon Island Auxiliary Dam

Through a best value proposal evaluation process, Reclamation selected Shimmick Construction (general contractor), Malcolm Drilling Company (drilling subcontractor), and Brierley Associates (contractor's engineer), to build the key-block. The Owner provided performance requirements for the unique site conditions to minimize dam safety risks during construction, however, the means and methods for temporarily supporting the excavations required to construct the key-block were not explicitly specified; thereby allowing development of the most-cost effective approach to the project.

The contractors faced difficult subsurface site conditions including a high groundwater table, coarse-grained soils with gravels and cobbles, and bedrock. The geotechnical conditions presented challenges for the design and construction of support systems required to excavate up to 80 feet deep. An internally braced secant pile wall system was selected for excavation support and perimeter groundwater control, constructed in a series of cells in order to limit open excavation length along the dam toe.

Malcolm drew on their fleet of Bauer BG40 rotary drill rigs, with oscillator attachments and the latest advancements in tooling and procedures to facilitate the economical construction of the secant piling system in these difficult ground conditions. The structural wall system was integrated into a revised final seismic design of the key-block to maximize the use of these elements, to the benefit of the overall project cost and schedule. Secant pile drilling was completed early in 2012, and the concrete placement and backfilling was completed for the cells by year end. ■