Tiber Creek Tunnel Project

by Khaldoun El-Jallad

Ellicott City, MD, enjoys a rich and varied history, from its origin as the tiny trade center of Ellicott's Mills to the present seat of rapidly urbanizing Howard County. Main Street has experienced a gradual change in character from a mixed commercial and residential area to an almost entirely commercial area today. The boundaries of the town were reestablished in 1973 and designated a Historic District to preserve and encourage restoration of its old structures. Main Street follows a narrow ravine, and some buildings on the south side are constructed over the Tiber Creek. Many of the older homes and stores are constructed of local granite, including the La Palapa Restaurant located at 8307 Main Street.

Project site in Ellicott City, MD

Operations Manager Timothy Hill, PE, inspects the tunnel

In January of 2004, Howard County inspectors informed La Palapa Restaurant, otherwise known as "The flavor of Mexico in historic Ellicott City," that the east granite wall under the building had collapsed. The wall serves as foundation support for the restaurant and is a means of preventing scour from Tiber Creek, which travels through a tunnel beneath Ellicott City and the restaurant. Land Design and Development, the building owner, contacted Hillis-Carnes Engineering Associates (HCEA) to investigate the condition and provide a practical solution and permit continued use of the existing building and parking lot. The main consideration was public safety.

HCEA engineers Timothy Hill, PE, and Richard Sturtevant, PE, led a team of forensic engineers and technicians to investigate the collapse of the wall and develop a design that considered the foundation, stream, pedestrians, and operations of the restaurant. The initial investigation revealed that the wall collapse did not directly impact the building or parking lot foundations and that a catastrophic failure of these structures was not imminent.

Under the direction of Hill and Jyotin Choksey, PE, the lead forensic structural engineer designer, design parameters, bid documents and specifications were established. The design encompassed the entire 200 ft long by 15 ft tall (61 by 4.5 m) wall, as well as the widening of the walkway and plenum area used to access the mechanical and electrical supply to the restaurant. The design consisted of pressure grouting the granite wall to provide stability during construction as well as slowing the washout of sediments from behind the wall during high-peak water flow. The reinforced shotcrete wall was a minimum of 14 in. (35.5 cm) in thickness with two mats of epoxy-coated steel tied to the underside of the parking lot, building slab, and beams, as well as fixing the base of the new wall into the river rock bed for anchorage. In addition, several support steel beams that

exhibited a high loss of section due to water and oxidation were replaced with four additional beams supported by the newly constructed wall and stub beams within the walkway plenum and west wall on the opposite side of the river bed.

The construction was completed by Creative Concepts Group, Inc. (CCGI), a specialty foundation consultant and contractor and his subcontractors; JF Brinker and Sons, Inc., specializing in industrial and commercial concrete; and Masonry Resurfacing and Construction, Inc., specializing in shotcrete construction. HCEA construction materials group provided daily inspections and materials testing services.

The Tiber Creek channel was dammed and the water diverted through a large corrugated metal pipe. Installation procedures were instituted; trial shotcrete panels were constructed; and compressive strength core breaks were extracted, evaluated, and approved with the assistance of S & G Concrete's design engineers. Trial and error using a variation of dry and wet mixtures led to the use of a wet shotcrete design mixture. The reinforcing steel mat assemblies for the wall and walkway were then installed and fixed to rock anchors in the river bed and to the deck and the support structural steel beams.

After review, correction, and approval of the reinforcing steel assemblies and the installation of structural steel replacement beams, concrete foundations, and rock anchors, shotcrete placement of the wall commenced and was completed. The backside formwork at the top of the wall that created the inside face of the walkway plenum wall was then removed and the wall rubbed down to eliminate slight imperfections. The walkway slab was then poured and the plenum mechanical piping and electrical lines were moved and updated. The diversion pipe was removed, scour protection installed at the base of both support walls, and the river bed restored to its original follow pattern.

The parking lot area cordoned off for construction and weight restrictions set by HCEA design engineers was reopened and parking returned to its normal pattern. At no time was the restaurant facility or the establishments in the building straddling the below-grade tunnel closed due to construction activity.

A variety of elements were considered and successfully integrated into the completion of this project. These included public health and safety, property and financial investment, historical preservation, engineering and design, and construction means and methods. At no time was the public at risk or the day-to-day operation of the restaurant and adjacent parking areas adversely affected. HCEA implemented a program and will monitor the structures on an ongoing basis.

Additional Project Information

On May 31, 2006, Hillis-Carnes Engineering Associates, Inc., was pleased to receive the Excellence in Concrete Award, Rehabilitation Category, from the Maryland Chapter of the American Concrete Institute for its participation as the structural engineer in the Tiber Creek

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Tunnel Project. The American Concrete Institute recognized this project based on design, concept, originality, and applicability of concrete. A variety of elements were considered and successfully integrated into the completion of this project including public health and safety, property and financial investment, historical preservation, engineering and design, and construction means and methods. The awards banquet was held at the Engineers Club at the Garrett-Jacobs Mansion in Baltimore, MD. The full project scope can be reviewed on the Hillis-Carnes website: **www.hcea.com/newsletter_spring2006**.

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Project Location
Ellicott City, MD
8307 Main Street, below La Palapa Restaurant

Owner
Land Design & Development

Structural Engineer
Hillis-Carnes Engineering Associates, Inc.

General Contractor
Creative Concepts Group, Inc.

Concrete Specialty Contractor
JF Brinker & Sons, Inc.

Concrete Supplier
S & G Concrete Company

Khaldoun El-Jallad *has held various positions over the last 20 years, including Field Operations Manager, Division Manager, and Project Manager. El-Jallad has been with Hillis-Carnes Engineering Associates, Inc., for 12 years as a Senior Project Manager. El-Jallad has a BS in Agricultural Engineering from the University of Delaware, Newark, DE. He has managed numerous projects over the years involving deep foundation installations, load tests, PDA operation pile projects, soils, concrete and various failure investigations and corrections, concrete finishing manholes, and bridge inspections. El-Jallad has also previously served as the Division Manager of an environmental construction management group. His duties included the management of projects involving groundwater remediation, treatment and control, soil remediation, UST removals and installations, landfill installation monitoring and closure, building and pavement design, and installation and roof monitoring services. He is a member of the National Society of Professional Engineers, the Maryland Society of Professional Engineers, EDI Moisture Analysts, the American Concrete Institute, and the American Welding Institute.*