



Left photo: Tree stumps and large sections of asphalt had to come out before installation of the Impact System.

Right photo: Flags identify spots designated for micropiles.



## WHEN **GOOD** THINGS HAPPEN TO **BAD** SOIL

### PRIVATELY FUNDED APARTMENTS IN COLLEGE PARK, MARYLAND, TO OPEN THIS SPRING AFTER GROUND IMPROVEMENT

by Chris Ourand<sup>1</sup>

Boring into the earth to depths in excess of 30 feet, the rig lost its downward momentum. The operator was accustomed to encountering hard spots as the machine advanced through the fill material, but in this case it hit an obstruction hard enough to cause the machine to completely stop and bounce.

"Whatever was down there was solid enough that we had to stop, figure out what it was and whether we could get through it or if it would have to be dug out," says Ken Lightbody, project manager for Purcellville, Virginia-based GeoStructures, Inc., a design-build firm. The company was in the process of installing Rammed Aggregate Pier (RAP) elements to reinforce the soil prior to construction of The Enclave at 8700, a student housing complex in College Park, Maryland.

Further investigation of the area brought up big chunks of concrete, stumps and other debris, including eight- to 12-inch thick sections of asphalt.

"It was probably a road that ran along the adjacent stream before the site became designated for fill material when U.S. Route 1 was widened in the 1950s," says David Schultz of Specialized Engineering, the

geotechnical engineering firm that did the test borings. The boring profile showed uncontrolled fill over alluvial deposits, which would not support the large building and would require ground improvement across the 2.4-acre site.

#### **RAP has an Impact on Site Stability**

To properly stabilize the area, plans called for the RAP elements to extend through the fill and loose soils and into more dense soils. After additional equipment was brought on site to penetrate the troublesome asphalt layer, crews continued with installation of a specialized type of RAP system called the Impact System. Well-suited for sites consisting of loose soils with high groundwater tables that are susceptible to caving, the Impact System utilizes a displacement method as it drives a beveled mandrel to design depth. The mandrel is then lifted and the resulting cavity is filled with compacted aggregate that is forced downward and outward to create lateral pressure on the surrounding soil. The multiple, one-foot lifts of compacted aggregate lead to a RAP element that can double the bearing capacity of soil.

"On a confined site like this, the Impact System has an added benefit in that it doesn't generate spoils, so





*After the Impact System is installed, crews prepare to pour spread footings.*



*Paint Branch Creek runs behind The Enclave and provided one of many reasons that development efforts had a strong focus on environmental design.*

there are fewer equipment and transportation needs, which also provide a cost benefit," adds Lightbody.

### **Greening the Enclave**

Originally planned as a hotel by owner Star Global Ventures, the building concept changed because of the acute need for more student housing at the University of Maryland. Now known as The Enclave at 8700, the seven-story building is set to open during the 2011 spring semester as a model for upscale student housing. The mixed-use structure features study lounges, a fitness center, laundry room and bike storage, as well as 10,000 square feet of retail space to eliminate some vehicle trips and promote sound environmental practices. Shuttle buses will run between The Enclave and campus.

Aiming for Leadership in Energy and Environmental Design (LEED) silver certification, the building will feature a white membrane roof that minimizes energy usage. Other green design elements are the two levels of underground parking that reduce the amount of surface paving, as well as the use of Energy Star-rated appliances, lighting and windows. In addition, more than 40 percent of the construction materials were sourced regionally, including the aggregate used for the RAP system.

The building model fits well with the Route 1 Sector Plan, the guiding document created nine years ago by the Maryland-National Capital Park and Planning Commission to encourage dense, mixed-use development. It aims for a town-center-like setting that favors pedestrian and bicycle mobility.

### **More Site Complexities**

Before these green design benefits could be realized, there were site environmental conditions that had to be addressed during the pre-construction phase. Paint Branch Creek sits at the bottom of a slope at the rear of the site, close enough to raise concerns that the fast-moving water could erode foundation support materials. To prevent the effects of this process known as scour, which can affect the structural integrity of buildings, plans were adjusted on two fronts. First, the U.S. Army Corps of Engineers, which has jurisdiction over Paint Branch Creek, deployed a solution to stabilize the channel and keep it from shifting during periods of heavy flow. Second, GeoStructures installed micropiles under the footings near the stream. The steel casings of the micropiles provided the rigidity needed to protect the foundation from damage if scour occurs.

Overall, more than 900 RAP elements were used to support the footings and approximately a dozen micropiles were installed in areas where scour was



a concern. Some of the RAP elements required grout during construction because several of the soil borings indicated the presence of organic material, which could lead to long term settlement.

"The grout provides additional rigidity in the RAP elements when you can't be certain how the soil will perform both immediately after a load is placed on it and over time," notes Lightbody.

Another complication of the site is its close proximity to the busy Route 1 corridor and adjacent businesses. Excavating the 20-plus feet to the lower parking level would have affected the structural integrity of the road and properties next door, so GeoStructures also designed and installed a temporary support for the excavation system that consisted of soldier piles and lagging.

Above ground, the biggest unexpected impediment was a historic storm that dumped several feet of snow on the site. Even though snow can be removed fairly quickly, the challenge was to find somewhere that would accept the snow and wet soil excavated for the below-grade parking. Dump sites were closed, inaccessible or unwilling to take wet material, and although contracts in general allow for a certain number of days of weather-related delays, waiting for snow to melt and soil to dry quickly uses them up.

In the end, project challenges were overcome with innovative design and installation techniques, as well as

teamwork. "General contractors can manage dozens of subcontractors, which can present coordination challenges and other complexities," says Biju Mathew, senior project manager for general contractor Herman/Stewart Construction and Development, Inc. "When we can use one [subcontractor] with one point of contact that can handle multiple activities related to sub-surface soil remediation for foundations, for example, we prefer that."

Concludes Mathew, "There are always unknowns on a job, but their impact is minimized with a project team that has complementary capabilities and the flexibility to deliver them quickly." ■

<sup>1</sup>Chris Ourand frequently writes about construction and related issues. Contact him at [chris@chriscom.com](mailto:chris@chriscom.com).



The Enclave at 8700 will help meet the need for more off-campus student housing in College Park, Maryland.



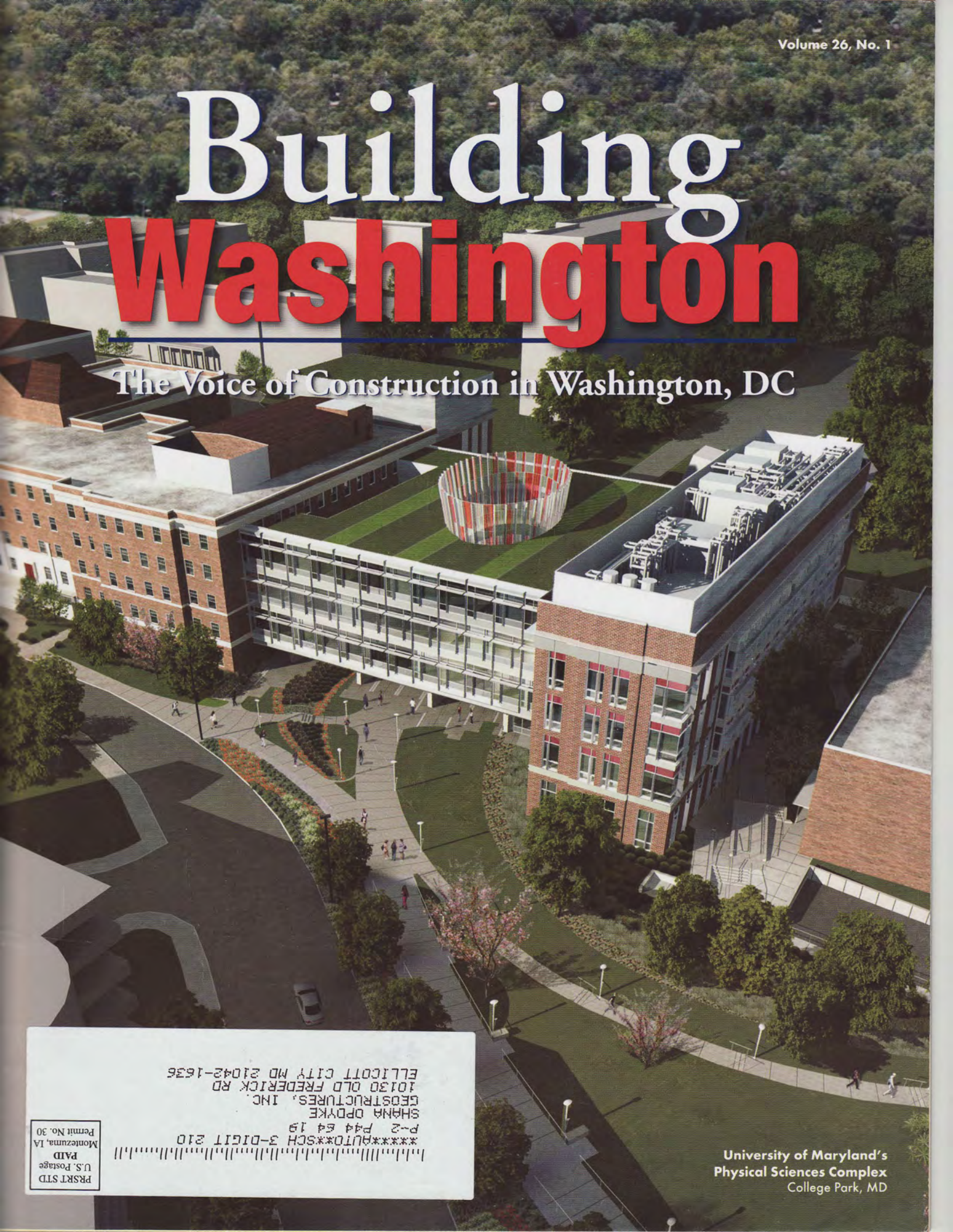
Graphic by Geopier Foundation Company.

The rig on the right is demonstrating the Impact System as the aggregate poured into the cavity is compacted and forced downward and outward to create lateral pressure on the surrounding soil, doubling its bearing capacity.



# Building Washington

The Voice of Construction in Washington, DC



\*\*\*\*\*AUTO\*\*SCH 3-DIGIT 210  
P-2 P44 64 19  
SHANA OPDYKE  
GEOSTRUCTURES, INC.  
10130 OLD FREDERICK RD  
ELLICOTT CITY MD 21042-1636

PRSRST STD  
U.S. Postage  
PAID  
Montezuma, IA  
Permit No. 30

University of Maryland's  
Physical Sciences Complex  
College Park, MD