

# Drilling in a new direction

Repair of flood-damage at Cumberland River Park calls for creative application of a Hütte 504 drilling rig's unique ability to drill 45° beneath itself

*Flooding along Cumberland River Park's overlook caused the retaining wall to lean out into the river. Geofirma created a platform between the new sheeting piling and the pre-existing sheet piling to drill from. The small blue Hütte 504 in the lower center of the photo shows how dramatic the angle is. The mast is positioned at a 45-degree angle back under the rig to simultaneously drill and advance 7 5/8-inch casing 105 feet through river rock, silt and fine sand 20 feet into a solid rock socket.*





**ERIC SNYDER**, GeoFirma Owner

Tennesseeans know it as Nashville's Thousand Year Flood, the deluge brought on by a saturated weather front when it stalled over Central and Western Tennessee in early May 2010. It dropped up to 20 inches of rain in the span of only a few days.

It took weeks for the region's affected watersheds to drain themselves. Rivers such as the Cumberland hit all-time records for cresting and flooding. Downtown, along what had been the Cumberland's steep banks, railroad tracks lay more than 6 feet under. And in Nashville the Grand Old Opry's famous stage was 46 inches underwater.

Three years later, some restoration projects were still dealing with the damage. One was the retaining wall repair for Cumberland River Park, a new visitor site and playground along the shoreline between

Titans Stadium and the Korean War Veterans Memorial Bridge. The wall had been pushed out and now was now leaning over the river. The ground it had been holding back to support a scenic overlook was sinking into the gap. To fix it, general contractor Blakley Construction Services, of Brentwood, Tenn., teamed up with GeoFirma, a Nashville-based contractor specializing in municipal and commercial geotechnical projects.

Michael Thomas, co-founder of Blakley Construction Services, explained GeoFirma's role in the repair. Blakley had installed new sheet piling, but before cutting away the damaged retaining wall, GeoFirma was to drill and grout three stranded cable anchors 105 to 120 feet in drilling length, at 45 degrees into the bank, ensuring at least a 20-foot socket in the bedrock for additional stability in the new retaining system.

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**Eric Snyder**, GeoFirma Owner

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*From its perch atop a 20-foot long platform spanning the gap between new and old sheet piling on the banks of the Cumberland river, it sits ready to drill the first of three 105-foot anchors. It was the only drill in its size with the power GeoFirma needed for the job—as well as the only drill GeoFirma found that could drill at a 45-degree angle back under itself.*



### Matching equipment to the job

GeoFirma owner Eric Snyder found a way to avoid the substantial time and cost that would have been invested in building a platform in the river itself to drill from. If he could locate a compact yet powerful crawler drill rig, he could drive it onto a temporary deck that would bridge the gap between the old and new piling.

Sales rep Stacy Lynn of the Atlas Copco—Nashville store matched up Snyder with a Hütte HBR 504 hydraulic crawler drill and a 7 5/8-inch Atlas Copco Symmetrix simultaneous drilling/casing advancement system with Secoroc QL 60 down-the-hole hammer. An Atlas Copco XVRS 1000 portable compressor fed air to the hammer at 1,000 cfm and 180 psi.

Snyder said: “The Hütte 504 was the only drill its size with the power we needed, and it was the only drill we could find

that could drill at this great an angle under its own tracks. We wanted to work from a bridge between the old sheet piles and the new. If we had tried to mount a drill to an excavator, we would easily be over 50,000 pounds. We’d have had to build a platform in the river to work from. The cost on that would have been exorbitant.”

The Hütte’s maximum weight is just under 25,000 pounds. Though only 6 feet 10 inches wide and 20 feet long configured with mast down for tramping, the rig has 8,500 pounds of crowding force, 13,900 pounds of extraction force, and more than 4,200 foot-pounds of torque.

### Simultaneous casing advancement

Soil conditions behind the sheet piling consisted of river rock and pebbles of various sizes the first 85 feet. After cutting a hole in the old piling at the entry point, GeoFirma

covered it temporarily with plywood to prevent cavitation. Snyder and his crew then went to work.

GeoFirma used the Symmetrix system to drill 7 5/8-inch threaded casing through 85 feet of unconsolidated ground and then 20 feet into bedrock. Then GeoFirma inserted stranded anchors into the socket and cemented them with neat Portland grout simultaneously with casing withdrawal. Snyder explained that he kept a 10-foot head on the cement in the casing as he withdrew it.

The unusual drilling angle made the casing and rod connections a unique challenge. In vertical drilling, Snyder said, he would simply have used the winch to position sections of rod and casing. Instead, Snyder and Lynn devised a sling system to put each nested pair of 2-meter 3 1/2-inch drill pipe and 7 5/8-inch casing in place.

“We knew going in it was an ambitious >>

» project,” Snyder said. “There was concrete to go through, man-placed river gravel fill, then saturated silt and ultrafine flowing sands before hitting rock. Not to mention, between the pilings, you have that 20 feet of unsupported drill string before you start drilling.”

Snyder said techniques other than using a simultaneous drilling and casing advancement system might have been to put a roller cone or drag bit in front of the casing, “but using Elemex or Symmetrix made the most sense. We’re penetrating the unknown without disturbing it.”

As for choosing Atlas Copco over competitive versions of Elemex and Symmetrix, he said, “We did consider similar systems, but truthfully, I didn’t think they’d hold up.”

Snyder had started with Elemex and probably would have finished with it, he said, but Symmetrix was faster due to its slightly different configuration. Symmetrix’s bit protrudes farther than the ring bit. Elemex, which is designed for ultimate control of air, has its bit tucked back inside the ring bit. When Atlas Copco representatives suggested he try Symmetrix, Snyder found that Symmetrix worked best for him in the complicated ground conditions, and he appreciated having that choice.

### Neighborly partner

Snyder emphasized that his confidence to take on such difficult projects comes from customer support. Snyder first hooked up with Lynn four years ago. “I was looking for a local source for all my geotechnical equipment and supplies: top hammer drills, hollow MAI bar, everything. That’s when I met Stacy. Atlas Copco has been integral in growth of our company. They’ve introduced us to new drilling techniques. On jobs where it was questionable which technique would be the best choice, they acted as consultants.

“Support from Atlas Copco is second to none. In this day and age, in this economy, customer service is everything. When I needed hammer service, I just dropped it off at the end of the day. They stayed late, tore it down, cleaned it and had it back together ready for me in the morning. And it wasn’t just local support. Due to the difficulty of this job, they flew in a Symmetrix expert twice as well as the top Hütte representative.”

Snyder said GeoFirma bought the Symmetrix system and QL 60 hammer and he was impressed enough with Hütte to look into purchasing his own Hütte drill. 



*(above) Stacy Lynn, of the Atlas Copco–Nashville store, is on site as GeoFirma owner and driller Eric Snyder begins the first of three 105-foot anchors. The anchors consist of stranded cable grouted into a 20-foot rock socket in the Cumberland River Park Stabilization Project at the park’s scenic overlook.*

*(below) The morning sun greets both the Music City skyline and the Hütte 504.*

