Keller prepares Hudson River for new tunnels

New York, United States

Operating from barges on New York's Hudson River, Keller is stabilising soils ready for one of the United States' most important rail transformation projects.

The project

The Northeast Corridor is the most heavily used passenger rail line in the US, with more than 2,000 trains carrying 800,000 passengers daily between New Jersey and New York. This vital corridor relies on a single 116-year-old tunnel that connects New York City to the rest of the continental US. Due to its antiquated design and damaged sustained during Superstorm Sandy, it is a source of chronic delays for 200,000 daily passengers.

The Hudson Tunnel Project, the cornerstone of a larger suite of infrastructure investments known as the Gateway Program, will finally deliver reliable transportation to millions of riders by building a new tunnel and rehabilitating the existing North River Tunnel from top to bottom.

The Gateway Development Commission (GDC) launched construction on the Hudson Tunnel Project in 2023, and Keller is hard at work on a mammoth task to stabilise the riverbed, ready for the tunnel excavation.

“A herculean effort”

“The technical proposal on a design-build project of this magnitude took a herculean effort over many long weeks,” says Dennis Boehm, Senior Vice President. “A large team of our experts helped develop the proposal and pricing, putting together a fantastic package that secured us the contract.”

Keller’s scope involves creating a continuous and contiguous block of strengthened soil – 1,200ft long, 104ft wide and 45ft thick – for the tunnel-boring machine to safely drill through.

The improved soil has to cover 11ft above the proposed tunnels, 5ft below and at least 12ft each side. It also has to be strong enough to support the tunnelling, but not so heavy or light that it shifts over time.

With these challenges in mind, Keller came up with a wet soil mixing solution, which involves mixing cementitious binders with water to form a slurry. This is then injected and mixed into the soil to produce soilcrete.

Value engineered for a more efficient solution

Typically, soilcrete elements are cylindrical and overlap to provide continuity. However, for this project, Keller proposed an innovative design that eliminated the column overlap. Instead, the team is using a low-pressure, large-diameter mixing process to install tangent primary elements, and a high-pressure, smaller-diameter mixing process for the secondary elements. Together, this creates a contiguous block without overlap.

This smart approach ensures 100 percent of the soil is treated but reduces the amount of soilcrete required, minimising waste and cutting the project’s carbon footprint by 25 percent. The design also accommodates for slight movements of the working platform caused by the tide, without affecting overall quality.

A total of 1,692 soil mix elements and 198 exterior wedge elements will ultimately be constructed.

Global support

With notice to proceed given in April 2024 and the first soilcrete column expected by early October, Keller had to pull out all the stops to be ready for this uniquely large and complex project.

“We needed to design and build one-off pieces of equipment and we needed them fast,” explains Paul Peskosky Jr, who stepped out of his role as Operations Manager at Keller’s Rockaway office to manage the project. “The lead up to production was a testament to our culture of operational excellence. We pulled resources – both brainpower and equipment – from just about every office in North America and several countries in Europe.”

In total five barges, each with a unique purpose, are being used along with over 35 critical pieces of equipment.

Protecting our people – and wildlife

The crew are operating within a flooded containment structure, which is designed to protect workers from the strong currents – while also protecting the river’s wildlife. Additional barges are used to store the binder and for batching, as well as for installing the jet-grouted wedge and coring elements. The soil mixing tooling was designed by Keller and custom-fabricated especially for the project

“We’re using conventional rotary drilling equipment with extended capabilities to reach the deepest elements – some 115ft below the river surface,” adds Dennis. “We’re installing in a primary-secondary

fashion to ensure full soil treatment.

“Verticality is crucial for stabilising the soil, so we’ve designed the tooling to be rigid and minimise flexing. We use down-hole inclinometers for accurate alignment.”

Working with the tide and seasons

Directly connected to the Atlantic Ocean, the Hudson River has daily tidal fluctuations of over 5ft. Therefore it’s essential to always know how deep the water is and how deep we have to drill.

“The barge is safe from the swift Hudson currents thanks to the sturdy containment structure, but it still rises and falls with the tide,” says Dennis. “Real-time GPS helps us adjust the depth of each element based on the water level at that precise moment.”

The operation is designed to progress in stages, with only 600ft of containment structure allowed in the river at any given time. This restriction is further complicated by in-water work seasons, which prohibit work outside the structure in the river from January to July.

“The crews on site are doing a great job keeping up with the strict schedules and maintaining the additional safety measures that come with working on water,” notes Dennis. “We’re really excited to see this project come to fruition and help improve New York and New Jersey’s infrastructure, one soil mixing element at a time.”

Project facts

Owner(s)
The Gateway Development Commission (GDC)

Keller business unit(s)
Keller North America

Main contractor(s)
Weeks Marine, Inc.

Solutions
Tunnelling

Markets
Infrastructure

Techniques
Jet grouting
Wet soil mixing