



Owner

Shelby County

Engineer

Geotechnology, Inc.

General contractor

Ford Construction

Dates of work

2015/09 2015/12

Description

In an effort to improve traffic and to expedite response times for emergency and service vehicles, an overpass crossing a railroad track was proposed for Fite Road in Millington, TN, north of Memphis in Shelby County. Embankments on each side of the track, to be constructed by Ford Construction, would lead to the bridge/overpass.

The embankments would be secured by three mechanically stabilized earth (MSE) retaining walls, two on each side of the track and one paralleling Fite Road.

Main figures

Stone columns

617 EA.

Ground conditions

The soil consisted of 30 to 36 ft of soft to medium-stiff silty clay, underlain by 25 ft of medium-dense to dense sand over stiff clay. The N-values for the upper clay layer ranged between 4 and 8, and shear strengths were approximately 1 ksf.

Due to the excessive height of the walls, global stability was a concern for both the static and seismic case. The sand layer below the clay was medium-dense to dense with N-values between 18 and 38. Portions of this layer were potentially liquefiable, though the majority of the sand layer was acceptable as a foundational stratum.

Several options were considered for remediation, including compaction grouting, soil mixing and stone columns.

Solution

USW installed 617 vibro stone columns (VSCs) for ground improvement beneath the three MSE walls. Through the method of vibro-flotation, liquefaction was induced in the lower sands and the layer was densified. This method reduces the potential for settlement due to earthquakes.

What's more, the VSCs reinforced the upper soft to stiff clays to improve global stability of the walls, while also reducing horizontal and vertical deformation. The drainage provided by the stone columns accelerated consolidation of the clay layer during fill placement.

In conclusion, USW and The Reinforced Earth Company (RECo), the wall designer-supplier, collaborated to meet the client's requirements for safety, quality and schedule.