Project Title: Sustainably Enhancing Intermodal Freight Operation of Ports using Geotextile Tubes

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TRB Keywords: Intermodal Transportation Systems, Freight Service, Infrastructure, Dredged Materials, Sustainable Development, Geosynthetics.

Funds Requested:
NCITEC Funds: $76,985.84
Matching Funds: $77,660.50

Project Description:
The objective of this project is to investigate application of geotextile tubes for sustainably enhancing intermodal freight operation of ports. Maintaining and improving operation of ports along the Gulf Coast and along the Mississippi River up to Memphis, TN require an almost continuous dredging throughout the year producing huge amount of very high moisture content fine grained soils (VHMS) as dredged materials. The U.S. Army Corps of Engineers (USACE) handles upwards of 200 million cubic meters of dredged material each year, of which only about 20 to 30 percent is used beneficially (EPA/USACE 2007). Chemically stabilizing VHMS using, for example, portland cement or portland/slag cement blends could simultaneously serve disposal and project needs with proper dosage rates and construction practices. Any means of handling or re-use of VHMS is potentially appealing. This project aims to explore potential applications of geotextile tubes filled with cementitiously stabilized dredged soils in ports.

Geotextile tubes are versatile products that have found their way into many applications including sediment containment, shoreline protection, and breakwaters. Typically, geotextile tubes are formed by sewing or gluing geosynthetic sheets together and then inflated with water, clay slurry, sand or waste sludge. The geotextile tubes are sometimes stacked together to form a higher dyke or other types of geotechnical structures. Traditionally, sand has been used to fill geotextile tubes for permanent applications, while fine grained sediments have traditionally been dewatered with but not used as fill for geotextile tubes. Howard et al. (2012) suggest using stabilized fine grained soils as geotextile tube fill in lieu of sand can potentially offer environmental, logistical, and economic advantages for some applications. This project will explore different aspects of using geotextile tubes filled with stabilized dredged soils in ports. The particular areas of interest which will be studied in this project include engineering properties, construction matters, sustainability and economic competitiveness of potential applications of geotextile tubes in ports.

The proposed research and educational plan has the following objectives:
1. Evaluate engineering properties of geotextile tubes filled with very high moisture content fine grained soils stabilized with more sustainable cementitious materials such as portland-limestone cement (PLC) and PLC blended with slag cement (a byproduct of iron production). PLC has not been studied within cemented soil systems in a comprehensive manner, in particular in the southeast US. In addition, studying PLC in conjunction with slag cement in cemented soil systems might reveal synergy effects that are especially interesting.
2. Develop methodologies that could allow ports to include geotextile tubes more readily into their design, construction, and operations decisions. These methodologies will consider the impact of the Panama Canal expansion where appropriate.
3. Study sustainability and economic competitiveness of geotextile tubes filled with cementitiously stabilized materials, and where appropriate compare their attributes to alternative approaches.
4. Educate students and the engineering community on the potential benefits of using cementitiously stabilized fine grained soils as geotextile tube fill.