MarTREC
Maritime Transportation Research & Education Center

MarTREC UTC Project Information Form
USDOT Tier 1 University Transportation Center
Agency ID or Contract Number DTRT13-G-UTC50

Project Title: EFFECT OF SWELL-SHRINK CHARACTERISTICS ON LANDSLIDES IN YAZOO CLAY
Project Abstract (Brief Description): Slope failures are frequent in highway embankments as well as in waterway infrastructures (levees) on expansive Yazoo clay in Mississippi which cause significant maintenance problems and require millions of state and federal dollars to fix it. After construction, the strength of the high plastic clay degrades with time due to the seasonal temperature and moisture variation, which is one of the major factor of slope failure. However, no study is available on the strength reduction of Yazoo clay soil. The current study intent to investigate the repeated drop in the shear strength of the Yazoo clay soil with wet-dry cycles which cause slope failure. Highly plastic Yazoo clay soil samples will be collected from slope sites to investigate the soil mechanical properties. The high plastic Yazoo clay samples will be tested at the laboratory to investigate the effect of wetting and drying cycles on the degradation of the shear strength. An advanced numerical modeling using Finite Element Method will also be conducted to evaluate the effect of different frequency and duration of rainfall (based on historical rainfall data of Mississippi) on the water intrusion and corresponding change in the factor of safety of the highway slope. The laboratory study and numerical analysis results will be combined to investigate the failure mechanism of slopes in highway embankment and waterway levees in Mississippi and develop a model that connects the wet-dry cycles and rainfall volume with the factor of safety of slope. The developed model will improve the design of the slopes in highway embankment and waterway levees, and will save the maintenance dollars.
Describe Implementation of Research Outcomes: The proposed project will develop model that connects the repeated shrink-swell behavior and progressive saturation of Yazoo clay due to rainfall, which will help transportation officials and Levee owners to predict the slope failure before it actually happens and repair it to maximize the system capacity.
Impacts/Benefits of Implementation: Investigation of the failure mechanism and development of the model will improve the design of the slopes in highway embankment and waterway levees, and will save the maintenance dollars. The proposed research effort has been carefully designed to appropriately address the MarTREC mission in the area of “Multimodal Infrastructure Asset and Material Resiliency”, and “Sustainable Multimodal Infrastructure”.
Web Links: martrec.uark.edu
Budget (Funding) Amounts & Source(s) (US DOT +Match(s) =Total Costs): 57.5k USDOT + 28.75k matching = 86.25k total
Project Start and End Dates: 07/01/2017 – 06/30/2018. Project complete.
Principal Investigator(s) and Contact Information: Mohammad Sadik Khan, PhD, PE. Phone: 601-979-6373, Email:J00797693@jsums.edu
Principal Investigator Institution (University): Jackson State University (JSU)