

CEE 595F – Geotechnical Seminar – ONLINE

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Electrical Geotechnics

Stacey Kulesza,
Kansas State University



Speaker Bio: Stacey Kulesza is an associate professor at Kansas State University in the geotechnical area. She received her B.S., M.E. and Ph.D. in Civil Engineering from Texas A&M University. Dr. Kulesza's research focuses on in situ and laboratory characterization of geo-materials with applied geophysics, identifying anthropogenic impacts on soil properties, and monitoring deteriorating infrastructure. She also studies asset-based frameworks that support diverse pathways towards creating authentic engineering identities. Her research sponsors include the US Department of Transportation, Federal Railroad Administration, National Science Foundation, Kansas Department of Transportation, and the U.S. Department of Agriculture. She is a licensed engineer in the State of Kansas as was the 2018 Kansas Society of Professional Engineers Tri-Valley Young Engineer of the Year.

Abstract: Galvanic electrical resistivity methods are widely used near-surface geophysical techniques that are valuable in many geotechnical studies. The most common geotechnical applications are field-based electrical resistivity tomography (ERT) surveys during site investigations to select borehole locations prior to drilling or to map stratigraphy between boreholes. Although this methodology is valuable and can be a cost-effective means to characterize a site, the physical and chemical electrical properties of geo-materials present novel opportunities in geotechnical research. This presentation will focus on the reconnaissance of a damaged levee in Illinois that was repaired several times. In 2015-2016 the site experienced extreme damage, with over 50 sand boils within less than 100 m along the levee. A combination of historical data with field and laboratory electrical methods were used in this investigation. The goal was to determine the material properties of the levee, visualize the depth of a seepage channel, and identify potential damage not evident at the surface. The methodology resulted in successful identification of damage within and beneath the levee. This presentation will also include the fundamentals and limitations of galvanic electrical geophysical methods and additional projects to demonstrate applications beyond geotechnical site investigations.

