PRIORITIZING BRIDGE SCOUR MONITORING WITH ELECTRICAL RESISTIVITY TOMOGRAPHY

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Scour, the removal of soil due to water flow, is the leading cause of bridge failure and a significant geohazard. As such, there is a national priority for state department of transportations (DOTs) to monitor scour critical bridges for the safety of the traveling public. There are over 600,000 bridges in the US and 500,000 of these are over waterways. Identifying scour critical bridges and monitoring these structures are substantial tasks. It is unrealistic for DOTs to measure soil erosion potential at each structure because this would be time consuming and costly. Furthermore, empirical equations to predict soil erosion potential, specifically in fine grained soils, remain inaccurate. Soil erosion potential is influenced by complex interactions of soil properties, many of which also control the bulk electrical resistivity of soil. The objective of this research was to determine if electrical resistivity tomography (ERT) can rapidly identify soil erosion potential, specifically for bridge scour assessment. Twenty-one bridge sites were selected by the Kansas DOT for this purpose. ERT surveys were conducted at each bridge site and soil samples were collected for characterization and laboratory erosion testing. Based on this dataset, soils with resistivity over 50 Ωm have 87% probability of being high erodibility; soils with resistivity under 50 Ωm have 84% probability of being low to moderate erodibility. If implemented into practice, DOTs can use ERT to rapidly identify scour potential and prioritize bridges for additional testing and long-term monitoring.