**DRILLING DEPTH ESTIMATION AND AQUIFER MAPPING USING ELECTRICAL RESISTIVITY TOMOGRAPHY**

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Goodwin Creek is a headwater stream in the northwestern part of the Yocona River watershed (Panola County, Mississippi) where the Sparta Sand aquifer outcrops. The Yocona River is a tributary of the Yazoo River, which ultimately flows into the Mississippi River. Surface runoff and groundwater flow are responsible for surface and internal soil erosion near the creek. The soil erosion creates soil pipe collapses and gullies that are affecting the agricultural fields and the pasturelands. Multidisciplinary geophysical and hydrogeological research are being conducted at a study site in the Goodwin Creek watershed to monitor groundwater flow in the unsaturated and saturated zones and understand surface-groundwater interaction. Electrical Resistivity Tomography (ERT) is a geophysical method suitable for delineating aquifers and characterizing aquifer heterogeneity. An ERT survey was conducted at the study site to map the underlying aquifer, estimate drilling depths for proposed monitoring wells, and provide suggestions for a groundwater extraction well. A 501-m long ERT profile was acquired along a topographic gradient using mixed dipole-dipole and strong gradient array with 3-m electrode spacing, starting from the creek and extending 170 m through a flat row crop field and 331 m up a hillslope into a pastureland. The finite element method and the Cholesky decomposition solver with Dirichlet boundary conditions were used for inversion of the collected ERT data. The inverted resistivity section is used to delineate the aquifer and estimate the drilling depths for the monitoring wells. Results show that in general the aquifer is relatively thin (<10 m) near the creek and thick (>30 m) under the pastureland. The depth to the top of the aquifer is variable, outcropping or thinly confined over a short distance (<10 m) in the pastureland about 260 m away from the creek but confined on both sides of the outcrop. Disturbed and undisturbed soil samples were collected down to 1.5 m at multiple locations along the profile after the ERT survey. Collected soil samples were generally consistent with our ERT results on outcropping and confining nature of the aquifer. Vertical inverted resistivity profiles suggest that the drilling depth for the monitor wells adjacent to the creek and at the hilltop in the pastureland will be the shallowest and deepest, respectively, at the study site. Considering the aquifer thickness (potentially exceeding 40 m), the proposed location at the hilltop in the pastureland might be a good location for installing an extraction well.

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