Two Dimensional Resistivity Survey Paired with a Hydrogeological Study of a Solute Plume through the Sparta Sand Member of the Claiborne Group, Nacogdoches County, TX

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ABSTRACT

A combined geophysical and hydrological study was conducted in a sandy loam near the campus of Stephen F. Austin State University in Nacogdoches, Texas. The study area contains three preinstalled piezometers and is located in the Sparta Sand of the Eocene Claiborne Group, a regressive tract of the Eocene sea.

Electrical Direct Current (DC) resistivity surveys were conducted across three 56-meter traverses using AGI's multi-electrode SuperSting R8 WIFI RES/IP/SP system, allowing eight measurements to be conducted simultaneously. Surveys were conducted using the dipole-dipole array configuration, which has been proven to produce high-quality horizontal resolution. A saline solution was added to an infiltration pit daily for a two-week period. DC dipole-dipole surveys were conducted every other day during the time of the addition of the saline solution into the infiltration pit. DC resistivity data was processed and interpreted using AGI's EarthImager 2D inversion software. Soil samples from six locations were collected and analyzed in order to understand the soil composition characterizing the permeability and porosity. The geophysical data acquired was paired with a hydrogeological survey of the area in order to accurately track the migration of a solute plume through the sandy loam. The data acquired provided useful information on the rate of infiltration as well as the migration pathway of any future contaminant spills.

The principal objective of the study is to track the flow pattern and rate at which a known conductive aqueous solution flows through sandy loam. This geophysical study alongside a parallel hydrologic study will improve tracking of the solute plume through sandy loam and allow researchers to monitor any interaction with groundwater. Knowledge gained from this study will be able to be used to in contaminant spills migration assessment.

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