

WATERBORNE-GEOPHYSICAL SURVEYS TO CHARACTERIZE STREAMBED SEDIMENTS FOR IMPROVING HYDROLOGIC FRAMEWORKS

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An existing groundwater flow model of a regional aquifer system underlying part of the Mississippi Alluvial Plain (MAP) uses streambed hydraulic conductivity values that were determined through model calibration. Preliminary results from uncertainty and data-worth analysis showed that streambed hydraulic conductivity is a forecast-sensitive parameter –uncertainty in the model input resulted in low confidence in the ability of the model to forecast groundwater-surface water interaction and groundwater levels. Reducing uncertainty in both types of forecasts is possible by better characterizing the hydraulic properties of the streambed through field-level studies.

The U.S. Geological Survey (USGS) has completed waterborne-continuous resistivity profiling along 1,100 kilometers (km) of streams that lie within the groundwater model domain to characterize streambed hydraulic conductivity values. Lithologic samples from streams and boreholes in the study area showed a positive relation between resistivity and sediment grain size. These data can be used to map changes in lithology of the streambed and identify areas of groundwater-surface water interaction. Resistivity data were modeled using a one-dimensional laterally-constrained inversion. The thickness and resistivity of the water column were constrained in the inversion using depth and conductivity information from an echosounder and a water-quality sonde. Resistivity profiles of each stream were used to identify boundaries of major geomorphological features and lateral and vertical variations in the lithologic properties of the streambed. Currently, resistivity-hydraulic conductivity relations from published sources outside of the study area are being used to translate resistivities to estimated streambed hydraulic conductivity for input into the regional groundwater model. Future work will consist of downhole permeameter and borehole nuclear magnetic resonance logging tests that will establish a local relation between resistivity and hydraulic conductivity within the study area. The resistivity data from this study have also been used to aid biological site assessments and facilitate planning and placement of water-control structures.