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Application of Numerical Groundwater Model to Determine Spatial Configuration of Confining Unit Breaches near a Municipal Well Field in Memphis, Tennessee

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Development Of A Numerical Multi-Layered Groundwater Model To Simulate Inter-Aquifer Water Exchange In Shelby County, Tennessee

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Type of Entry: Thesis

Thesis Title: Development Of A Numerical Multi-Layered Groundwater Model To Simulate Inter-Aquifer Water Exchange In Shelby County, Tennessee



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Memphis aquifer
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3D Model
Inter-aquifer

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Abstract: Inter-aquifer water exchange between the shallow and Memphis aquifers in Shelby County, Tennessee, poses a contamination threat due to the downward migration of younger, lesser quality groundwater, into deeper, more pristine aquifers. Discontinuities in the protective upper Claiborne confining unit (UCCU) allow for leakage into the Memphis aquifer, a sand-dominated aquifer that provides about 95% of the water used in the Memphis area. A multi-layered 3D groundwater model for Shelby County was created using the United States Geological Survey's MODFLOW-NWT program, to evaluate water exchange for a simulation period from January 2005 to December 2016. Results indicate an overall leakage from the UCCU of 61 m³/min into the Memphis aquifer in Shelby County, accounting for 10% of its water budget inflow, with localize areas experiencing as much as 20% water exchange. As young water tends to stay in the upper part of the Memphis aquifer, a higher mixing percentage is expected in that zone. Water budget assessment for the upper 60 m of the Memphis aquifer resulted in leakage representing 29% of the zone inflow, and as much as 53% in certain areas. Inflow from the Fort Pillow aquifer into the Memphis was found to be negligible. More Localized studies must be conducted to understand the location, characteristics, and orientation of the confining unit breaches, as well as the inter-aquifer water interaction.

Main Documents:   Development Of A Numerical Multi-Layered Groundwater Model To Simulate Inter-Aquifer Water Exchange In Shelby County, Tennessee

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