Introduction

The Arnold Air Force Base (AAFB) occupies about 40,000 acres in Coffee and Franklin Counties, Tennessee. The main mission of the base is research and development of aerospace systems. This mission is accomplished in part through a facility at Arnold Engineering Development Complex (AEDC), which operates from AAFB as the center of AEDC. The AEDC is particularly noted for its capability to quickly and flexibly conduct research and development and for its ability to conduct experiments at a pace that can be tailored to the needs of the customer. The purpose of this project was to determine the approximate location of the Manchester aquifer at the AEDC site and to map the potentiometric surface of the aquifer in the Arnold Air Force Base area, Coffee and Franklin Counties, Tennessee, 2002.

Hydrologic Setting

The Manchester aquifer is located in the center of the High Plains physiographic province (Franzmeier, 1986). Extending to the AAFB site is an area that includes Mississippi and Licking rivers (Figure 1). At the AAFB site, the Manchester aquifer consists of a 15 to 30-foot (4.5 to 9 m) thick interval of sands and gravels, which are generally interbedded with thin (less than 1-foot (30 cm) thick) clay units (Burchett and Hollyday, 1974). The sand units are characterized by high hydraulic conductivities, while the clay units are characterized by low hydraulic conductivities. The sand units are generally associated with the Tensas River, a major tributary of the Mississippi River. The clay units are generally associated with the Meramec River, a major tributary of the Ohio River. The sand units are generally recharge areas for the Manchester aquifer, while the clay units are generally discharge areas for the aquifer.

Exploration of Potentiotmetric Surface Maps

The ground water flow system encompasses two general areas: the Manchester aquifer and the Holocene (post-glacial) aquifer. The Manchester aquifer is the primary source of ground water for the AAFB and surrounding areas. The Holocene aquifer is a secondary source of ground water for the AAFB and surrounding areas.

Figure 3. Stratigraphic logging and geologic mapping in the Arnold Air Force Base area, Tennessee (Hileman et al., 1984).