SITE CHARACTERIZATION AND CONCEPTUAL MODELS OF THE REGIONAL GROUND-WATER FLOW SYSTEM, YUCCA MOUNTAIN AND VICINITY, NEVADA-CALIFORNIA

John B. Czarnecki and William E. Wilson
U.S. Geological Survey
Denver, Colorado 80225

ABSTRACT

Site-characterization plans have been developed to evaluate the suitability of Yucca Mountain, Nevada, for a mined geologic repository for high-level nuclear waste. Investigation of the regional ground-water flow system of Yucca Mountain and vicinity is an integral component of overall site characterization. On the basis of information that existed at the time, previous conceptual models of the regional ground-water flow system included an assumption that ground water flowing south from Yucca Mountain beneath the Amargosa Desert discharged as evapotranspiration at Franklin Lake playa, California, and as spring flow at Furnace Creek Ranch in Death Valley, California. Information obtained from more recent studies and re-evaluation of earlier data indicate that an alternative conceptual model of the regional ground-water flow system may be appropriate. A revised model could include the following concepts: (1) A regional carbonate aquifer underlies the ground-water subbasin in which Yucca Mountain is located; (2) upward flow, derived from the underlying carbonate aquifer, occurs from great depths within the subbasin; (3) some ground-water recharge may be occurring even in arid areas, such as at the Greenwater Range and the Funeral Mountains, California; and (4) the spring flow near Furnace Creek Ranch in Death Valley is from the regional carbonate aquifer, which forms a separate, underlying, confined flow system, rather than from the overlying ground-water flow system in which Yucca Mountain is located.

Modification of the conceptual model of the regional ground-water flow system by removal of the discharge boundary at Furnace Creek Ranch has implications for flow beneath Yucca Mountain: a smaller quantity of ground water would flow beneath Yucca Mountain than was estimated previously. For the conceptual model, inclusion of additional sources of ground water downgradient from Yucca Mountain would decrease even further the quantity of ground water required to flow beneath Yucca Mountain, on the basis of a water budget. The decreased flow beneath Yucca Mountain would translate into longer ground-water traveltimes beneath the potential repository site to the accessible environment through the saturated zone.

Planned site-characterization investigations are intended to describe the flow system and test these alternative conceptual models. Included are activities to: (1) Assess the regional hydrogeologic data needs; (2) define further the potentiometric-head distribution and the hydrogeologic framework of the regional flow system; (3) improve estimates of ground-water discharge by evapotranspiration in the Amargosa Desert and estimates of recharge from Fortymile Wash, thereby providing boundary-condition data for regional ground-water flow models; (4) refine numerical models of the regional ground-water flow system to incorporate alternative conceptual models and improvements in flow-system variables.

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