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MEMORANDUM 31 October 2000

To: Yucca Mountain File, Nye Co. N.W.R.P.O.
From: Don L. Shettel
Subject: Review of AMR/PMR: ANL-EBS-MD-000046 Rev 00.

Title: Physical and Chemical Environmental Abstraction Model

Problems with this report include:

DoE no longer includes backfill in its repository designs; thus this report is out of date.

The composition of groundwater entering the drift is uncertain. DoE still does not have a vadose zone water composition from a dripping fracture in the ESF. DoE doe not model boiling and condensation in the refluxing zone above the drift with its attendant precipitation and dissolution of minerals. A silica cap may develop above the drift implying changes in porosity and permeability in these rocks; these property changes are not currently modeled by DoE. Finally, DoE assumes a J-13 water composition enters drift; J-13 water is not a vadose zone water, nor is it in any flow path that includes Yucca Mountain.

Water dripping on the drip shield and canister may partially to fully evaporate, resulting in the development of brines. DoE does not consider the development of these brines on hot metallic surfaces, nor the fact that these surfaces are most likely non-isothermal.

DoE's geochemical model only includes those parameters thought to be important to metallic corrosion and radionuclide transport. These include chloride and fluoride concentrations, colloids, pH, ionic strength, and CO2 dissolved. Trace elements (such as lead and mercury, among others) are not included in any of DoE's abstracted geochemical models. Recent work by subcontractors to the State of Nevada suggests that trace elements are important to corrosion of canister material, especially alloy C-22, and probably the drip shield as well.

In conclusion, DoE's model is seriously deficient in tracking the parameters important to performance of the man-made barriers.