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NUMERICAL [illegible] OF NUCLEAR WASTE DISPOSAL IN ARGILLITE AT THE NEVADA TEST SITE*[illegible] and A. R. Lappin, Sandia Laboratories, Albuquerque, NM 87185.

Assessing the feasibility of underground nuclear waste disp[illegible] requires the development of computational models to determine the therm[illegible] response of the geologic media to the [illegible] of waste. Of primary importance is the reliab[illegible] extrap[illegible] of the predictive models to in-situ depth [illegible] scales. The present study con[illegible] the [illegible] of nuclear waste disposal at depth in argillite, a [illegible] shale, within the Eleana for[illegible] at the [illegible] Test Site.

[illegible] testing on core sample specimens, the [illegible] model has been defined in terms of a [illegible] law, a multi-axial failure surface, and [illegible] dependent thermal expansion coefficient. [illegible] in compression, the argillite [illegible] and a finite crush strength, [illegible] softening at larger deformations. Argillite [illegible] formation is, however, highly jointed with [illegible] of approximately 5-10 cm near surf[illegible]. At depth [illegible] joint spacings may be up to 30 cm or more. The [illegible] is multi-directional, and results in a rock m[illegible] entirely of small irregular blocks of intact rock [illegible] contact with each other. It is thus apparent that [illegible] possesses little tensile strength in situ. [illegible] contain varying amounts of expand[illegible] clays. Upon heating, to near the local boilin[illegible] of water, the clays dehydrate and subsequently cont[illegible] the rock mass containing them. Laboratory measure[illegible] argillite at ambient pressure have shown a contr[illegible] between temperatures of 75°C and 12[illegible]°C, follo[illegible] expansion at higher temperatures.

Up[illegible] heating in-situ, the effect of the negative therm[illegible] comprised of volumetric contraction coverin[illegible] of the argillite above approximately 85°C, a[illegible] pressure of not more than 1 atm. Since the ar[illegible] will not support tension, the defor[illegible] of interest in this zone is not fracture, but rath[illegible] of intact joint blocks and the opening of [illegible] joints.

Nu[illegible] for a near surface heater experiment in argillite conducted at the Nevada Test Site were performed using the finite element code ADINA assuming a two-dimensional axisym[illegible] geometry. The existence and extent of the region

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of tensional opening of joints surrounding the heater, predicted by the mechanical model, were confirmed by posttest borehole inspection, permeability measurements, and drillback. Extrapolation of near surface heater model to repository depths reveals the necessity for prior knowledge of the mechanical properties and state of stress in-situ. The extent of the joint opening zone, for example, is not altered by changes in the elastic moduli at the near surface, but is significantly decreased beyond certain depths depending upon the in-situ elastic moduli. Results of these calculations are presented.

To further define the behavior at depth, and place bounds on the [illegible] of [illegible] zone, far-field calculations were performed for a [illegible] repository in argillite. Both spent fuel and high level waste heat sources were considered at different burial densities and depths. Results of a parametric study are presented in which the mechanical properties, in-situ stresses, and waste heat sources were varied.