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Account No. 20.01402.461

U.S. Nuclear Regulatory Commission
ATTN: Deborah A. DeMarco
Office of Nuclear Material Safety and Safeguards
Two White Flint North
Mail Stop 8 D37
Washington, DC 20555

Subject: Submittal of Abstract Calculating Risk from Future Basaltic Volcanic Eruptions at the Proposed Yucca Mountain Repository Site, Nevada (AI 20.01402.461.050)

Dear Mrs. DeMarco:

Enclosed is an abstract for presentation at the November 2000 annual meeting of the Geological Society of America (GSA). This abstract is based on work conducted as part of the Igneous Activity KTI project and demonstrates how the results of technical investigations have been integrated into a total system performance assessment. Presenting the results of these investigations at a national scientific conference directly supports several NRC goals. This work demonstrates that the NRC is basing licensing decisions on realistic models and data, which have been shown to the scientific community. This work also supports public confidence that the NRC is an independent regulator that will use a wide range of techniques to evaluate safety issues. Following programmatic acceptance by the NRC, this abstract will be submitted to the GSA organizing committee for presentation in the November meeting in Reno, Nevada. If you have any questions please contact Dr. Brittain Hill at (210) 522-6087 or me at (210) 522-5252.

Sincerely,

Budhi Sagar
Technical Director

BS/re
Enclosure
cc:

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Calculating Risk from Future Basaltic Volcanic Eruptions at the Proposed Yucca Mountain Repository Site, Nevada

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and J S Trapp (U.S. Nuclear Regulatory Commission, Washington DC)

The annual probability of a new basaltic volcano forming through the proposed Yucca Mountain (YM) repository site is estimated at 10^{-8} to 10^{-7}, meeting regulatory requirements for a consequence analysis. Proposed regulations (10 CFR Part 63) specify a farming community 20 km south of YM as the "critical group" at highest risk during the 10,000 yr regulatory period. Risk to this group from future volcanic events is affected primarily by (i) eruption characteristics, (ii) interactions between volatile-rich magma and repository tunnels, (iii) waste-package and waste behavior in igneous events, and (iv) changes in airborne concentrations of contaminated ash particles through time. Our model assumes (i) the next YM eruption is violent strombolian in character, capable of relatively widespread tephra dispersal, (ii) the number of waste packages disrupted is related to the diameter of typical subvolcanic conduits, (iii) waste-package failure and waste fragmentation occur during basaltic eruptions, and (iv) initial airborne particle concentrations are 10^{-3} to 10^{-2} g/m^3, decreasing exponentially through time to around 10^{-4} g/m^3. The most significant uncertainties exist for assumptions (ii) and (iv). Subvolcanic conduits may interact with modified stresses around repository tunnels, potentially entraining more waste than currently assumed. Remobilization of tephra by wind, water, and farming is poorly understood in the YM region but can greatly affect airborne concentrations of contaminated ash through time.

Risk in any given year is formulated by summing the 10^{-7} probability-weighted doses received by the critical group from (1) an eruption in that year, and (2) older fall deposits from an eruption in each prior year. Our model indicates that peak annualized risk occurs in the first 1,000 yr after repository closure at about 1 mrem/yr. Similar risk estimates for other pathways, such as groundwater transport of radionuclides, are estimated 10x-100x lower than this value.

This work was supported by the U.S. Nuclear Regulatory Commission (Contract NRC-02-97-009) and is an independent product of the CNWRA that does not necessarily reflect the views or regulatory position of the NRC.