REVIEW OF ANALYSIS AND MODEL REPORTS (AMRs)

- Igneous Consequence Modeling for the TSPA-SR -- ANL-WIS-MD-000017

OVERVIEW

Included in the packet are each of the original AMRs, a copy of each with my brief annotations and a summary sheet for each that reveals the purpose and principal conclusions, as excerpted from the original, as well as my comments.

The AMRs were reviewed during October 2000. Each of the AMRs relies principally upon geologic data, much of which is derived from field studies. In view of the lack of 1) extensive, three-dimensional rock exposures and 2) full geochemical, chronologic, petrologic and other information necessary to completely characterize the geologic evolution of this region, the analyses and models are heavily dependent upon well constrained interpretations. In general, thorough and fully considered analyses are contained in this group of AMRs. My comments generally reflect a difference of opinion leading to an alternative interpretation rather than an error or omission in the AMR.

IGNEOUS CONSEQUENCE MODELING FOR THE TSPA-SR
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INTRODUCTION

The purpose of this technical report is to develop credible, defendable, substantiated models for the response of the repository to igneous intrusion and volcanic eruption. This AMR provides the technical basis for parameters that will be used by TSPA-SR in the igneous consequence models. Two igneous events, both of which result from the intersection of a dike(s) with the repository, are modeled within the TSPA-SR. The first event is a hypothetical volcanic eruption that intersects the repository and results in ash containing waste being ejected from Yucca Mountain. The second is an igneous intrusion that reaches the repository level, impacts the waste packages, and exposes radionuclides for groundwater transport processes.

Both of these events result from the intersection of a dike(s) with the repository. Both of these hypothetical events are modeled as resulting in exposing waste stored in the repository to transport processes. The objectives of the AMR are:

1. Develop conceptual models for volcanic eruptive and igneous intrusive groundwater transport releases from igneous activity consistent with the available conceptual models and data.
2. Document support from conceptual models and data.
3. Deliver conceptual model parameter inputs to the TSPA-SR.
4. Provide appropriate documentation for conceptual models, data, and parameters to relevant project databases.

This AMR recommends that ASHPLUME version 1.4 LV be utilized within the TSPA-SR to model potential volcanic eruption events at the Yucca Mountain repository.

The model of the igneous intrusion groundwater event should include the following assumptions: 1) the waste packages have been compromised to the extent that all of the waste in the affected packages is exposed, 2) after the magma cools, groundwater begins to flow through the zone with the flow characteristics and transport properties described in the Unsaturated Zone Model, and 3) upon reaching the water table the transport continues under the conditions described by the Saturated Zone Flow and Transport Model.

COMMENT

The models offered in this AMR relevant to the consequences of igneous activity are appropriately and sufficiently considered. Data that have been extracted from existing sources are used to design and support models for the transport of radionuclides following igneous disruption of the repository. The AMR also describes two criteria used to validate the models of processes consequent to igneous activity.

1) A conceptual model is valid if it is shown to be conservative with respect to the overall performance of the system in response to igneous disruption.
2) A conceptual model is valid if it is shown to provide a representation of the physical processes of interest that is consistent with available technical information and adequate for the purposes of the analysis.

Of these criteria, the second is difficult to fulfill because of the paucity of comprehensive information about physical processes, especially those involving igneous activity. Nevertheless, the authors of the report do the best that may be done.