Summary Report to NWTRB
Igneous Consequences Peer Review Meeting
of September 5, 2002

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This report summarizes impressions and conclusions regarding the potential consequences of igneous intrusion at the proposed Yucca Mountain repository (YMR). Comments are based on review of the "Interim Report" and on the presentations by panel members at the interim "Igneous Consequences Peer Review Meeting" in Las Vegas, September 5, 2002.

The panel have done a commendable job in initiating scoping analyses and order-of-magnitude estimates of process-defining material and magma properties, and in refining current understanding of processes of importance.

Emphasized by the panel, and confirmed by reading, is that the report has been written in sections, and subsequently assembled from its component parts. Despite this, the evolving report is thorough and comprises many instructive analyses. The panel are to be commended for their courage in releasing an early version of the document to both outline their respective views, and to focus discussion.

The report contains many original analyses to constrain the likely response of the repository to igneous intrusion. These analyses are useful in that they largely confirm the DoE project team's views of likely processes and potential outcomes. The report examines four primary topical areas:

Magma Properties: The review of data on likely magma properties, and their extrapolation to expected fluid-mechanical properties at the repository level is well advanced. The evaluations largely confirm the DoE team's prior evaluations.

Dike Ascent: The potential modes of dike rise are consistent with prior DoE views of ascent, and controls on this ascent. A significant new observation is the incorporation of the differentially-pressured lag-zone at the tip, some controls on its size, and the implication that this lag may have on the ultimate timing and form of interaction with the repository structure. The inability of estimated strike-lengths of modeled dikes to replicate the shorter observed strike-lengths identifies a gap in current understanding of the ascent process that is of undefined significance related to the potential interaction with the repository.

Dike-Repository Interaction: The potential modes of interaction in the ambient and elevated thermal condition have been confirmed with thoughtful scoping models. Feasible remain all prior ingress and egress scenarios, including the largely disruptive "dog-leg" and "underlying sill" behaviors. By their nature, these scoping studies are absent the effects of structure (*viz.* large scale sub-vertical faults and other features), and topography, each of which may exert significant control on the final form of the interaction.

In-Drift Interaction and Exterior Dispersal: Initial scoping studies conform to the prior views of the DoE project team.

In summary, the report has provided important independent appraisal of critical processes that may influence dike-repository interaction. These studies have largely confirmed the preliminary views presented at the May 22-23, 2002 meeting, and evident in prior DoE reports. Consideration of the lag-zone at the dike-tip is important in refining contemporary understanding of the

anticipated interaction with the repository, and in defining appropriate boundary conditions for the proposed in-drift magma-canister interaction calculations. All prior conjectured forms of dike-repository interaction, and modes of magma ingress to, and egress from, the repository remain viable. Specifically the broadly destructive “dog-leg” and “underlying sill” modes, remain unconstrained in their potential extent and disruption of the repository, and its inventory. The particularly intractable evaluation of dike-repository interaction remains absent the important controls of geologic structure, topography, and other potentially relevant parameters in defining the likely response. The specifics of how the findings of the interim report are providing guidance to the concurrent studies by the DoE project team, are not clear.

Respectfully submitted. Derek Elsworth.