



January 23, 1987

Mark J. Logsdon
Project Manager
Nuclear Waste Consultants
8341 So. Sangre de Cristo Rd - Suite 6
Littleton, CO 80127

Dear Mr. Logsdon:

Your review of "Groundwater Travel Time Analysis for the Reference Repository Location at the Hanford Site," SD-BWI-TI-303, by Peter Clifton, was recently brought to my attention. I wish to point out a misunderstanding regarding the source of the probability distribution for effective porosity used in the analysis documented by the report.

You state in your review that to augment the limited database Rockwell convened a panel of experts, "which decided on a reasonable range for the porosity of 10^{-2} to 10^{-4} ." You are then critical of Rockwell's assumption that effective porosity is normally, rather than log-normally, distributed.

As the analyst responsible for encoding the judgmental probability distributions from the expert panel, I was disturbed by the apparent lack of understanding regarding the results of our study. The values for the flow-top porosity obtained ranged over 5 orders of magnitude, with the probability distributions of all experts being approximately log-normally distributed. A single composite distribution that aggregated the distributions obtained from the five experts ranged from 10^{-5} to 10^{-1} . The mean value assumed by Rockwell (5×10^{-2}) is a factor of 10 higher than the mean of the composite distribution derived from our analysis (5×10^{-3}). Thus, our panel of experts endorsed neither the narrower range referenced by Peter Clifton and cited by you, nor the assumption of normality.

As a comparison of your analysis and that by Peter Clifton demonstrates, the probability distributions assumed for critical parameters, such as effective porosity, can have a major impact on conclusions. Unfortunately, such probability distributions cannot be derived from the statistical analysis of data, so expert judgment

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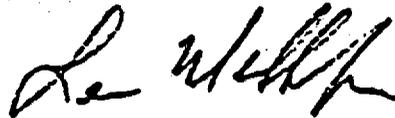
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must be used to justify the assumptions that are made. Experimental studies and empirical evidence show conclusively that judgmental probability estimates made without the aid of a formal process are subject to severe biases. It is for this reason that we believe that formal probability encoding methods must be used to derive all critical judgmental probability distributions used in important analyses. I would be happy to provide you with references or copies of papers if this topic is of interest to you.

I hope you find these comments helpful.

Sincerely,



Lee Merkhofer, Ph.D.
Principal

MJM:ms

bcc: David Stefken
Tom Longo
Akshai Runchal

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