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P. T. Prestholt
Sr. On-Site Representative
U.S. Nuclear Regulatory Commission
1050 E. Flamingo Road, Suite 319
Las Vegas, NV 89119

REQUEST FOR INFORMATION ON DATA NEED PRIORITY

Enclosed, in response to your verbal request, is a copy of the March 7, 1985, letter from Sandia National Laboratories to Los Alamos National Laboratory entitled "Priority of Data Needs by Performance Assessment."

Please note that the information contained in the letter represents an earlier summarization of the approach to prioritization of data needs and is currently undergoing refinement with the intent of issuing a more comprehensive document this fiscal year. Additionally, consideration and implementation of the performance allocation concept may impact the approach to prioritization.

In view of the above restraints, we would appreciate it if you could treat the enclosure as background material only, pending the availability of more current information.

Please do not hesitate to contact us regarding this matter.

for Maxwell B. Blanchard, Chief
Regulatory and Site Evaluation Branch
Waste Management Project Office

WMPO:MBB-457

Enclosure:
As stated

cc w/encl:
T. O. Hunter, SNL, 6310, Albuquerque, NM
F. W. Bingham, SNL, 6310, Albuquerque, NM
D. T. Oakley, Los Alamos, NM
C. W. Myers, Los Alamos, NM
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WM Record File 102.2
WM Project 11
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Sandia National Laboratories
Albuquerque, New Mexico 87185

March 7, 1985

Mr. Wes Myers
Los Alamos National Laboratory
Group ESS1
MS 329
Los Alamos, New Mexico 87545

Dear Wes:

Subject: Priority of Data Needs by Performance Assessment

The letter report which addresses this subject has been drafted to satisfy MS 126 and will be sent to NVO by March 31, 1985. A draft SAND report will be completed by May 1985 giving the details of the study done by Performance Assessment to evaluate the priority of the data needs. The ESTP can be written in anticipation of the completion of both of these documents however, and reference them. In order to proceed with writing the ESTP draft Revision 1, prior to the issuance of these reports, we have summarized the results of the study in Table 1.0. The priority of the data needs are categorized with respect to the numerical criteria in 10 CFR 60 for assessing long-term isolation and containment of radioactive wastes emplaced in the Topopah Spring unit at Yucca Mountain.

The ranking in Table 1.0 reflects preliminary sensitivity studies by Performance Assessment. Two particularly important simplifying assumptions were:

1) No dispersion in transport models of radionuclide transport. This does not significantly effect cumulative releases for long-lived radionuclides. The expected hydrologic conditions lead to the conclusion that predicted releases of short-lived radionuclides would still be well within EPA limits in 40 CFR 191 should dispersion be included in the analyses and the conclusions shown in Table 1.0 for Criteria 4 would not change.

2) Fractures are oriented parallel to flow direction, which is assumed to be parallel to gravity, and fractures are continuous through an entire unit thickness. This gives the "worst-case" analysis for $q/K_s > 1.0$.

The ranking was done in two steps. First, sensitivity coefficients were calculated for each parameter in the water and radionuclide transport model of the particular system involved. That is, numerical formulas expressing the sensitivity of the numerical criteria to each parameter as a function of the other parameters in the analysis model for the numerical criteria were derived. Then, expected values for all parameters were used to calculate numerical values for each sensitivity coefficient. The sensitivity coefficient was then multiplied by the current range of values for that particular parameter to obtain a so called "importance coefficient." This was our way of taking into account the current state-of-knowledge in the NNWSI project regarding the data for the parameters. In no way can we use these results to say how much data we need for each parameter, however, since variance of the geologic parameters was included in the current sensitivity study. Expected values and ranges of values were obtained, for the most part, from the EA.

Sincerely,

Nancy K. Hayden
NNWSI Repository Performance
Assessments
Division 6312

NKH:6312:mjh
Enclosures

Copy to:
6310 T. O. Hunter
6312 F. W. Bingham
6313 A. Stevens
6313 R. M. Zimmerman
6314 J. R. Tillerson
6312 N. K. Hayden
6310 NNWSICF
6312 File 1.2.232
6312 M. S. Tierney

Nomenclature

$\bar{N}$ = spatial average of effective matrix porosity

d = thickness of each unit (m)

K_s = spatial average of saturated hydraulic conductivity for matrix (m/yr)

q = percolation flux (infiltration at surface is upper bound) ($m^3/m^2 \cdot yr$)

c = empirical constant or group of constants in formula expressing hydraulic conductivity as a function of saturation

$\bar{b}$ = mean aperture of fractures (m)

A = effective water-intercept area of waste package (m^2)

S = solubility limit, S_i for i^{th} element, S_u for UO_2 matrix (kg/m^3 water)

$M_i(o)$ = expected mass of ith radionuclide (per canister) at closure time of repository (kg)

$\bar{T}_c$ = mean (or expected) time of loss of containment (kg)

σ^2 = variance in the loss of canister containment (yr^2)

$T_{1/2}(i)$ = half-life of the ith radionuclide (yr)

$C(t)$ = cumulative curies released to the accessible environment by time t (curies)

R = fractional release rate from EBS (yr^{-1}), assumed constant

$$R = \frac{1}{T_L} = \frac{nq\ AS}{M_{(o)}}$$

T_L = leach time (yr)

T_c = time of loss of canister containment (yr)

$T_t(i)$ = advective transport time to the accessible environment for i^{th} radionuclide (yr)

$R_f(i)$ = effective retardation factor for i^{th} radionuclide

T_w = groundwater travel time to the accessible environment (yr)

Nomenclature Cont'd

A(i) = specific activity of the ith radionuclide (Ci/kg, a physical constant)

n = number of waste packages (a design quantity)

$\lambda(i)$ = decay constant for i^{th} radionuclide (yr^{-1})

TABLE 1.0

Priority of Data Needed for Performance Assessments of the Yucca Mountain Site with Respect to the Numerical Criteria in 10 CFR 60 for Postclosure Isolation and Containment of Radioactive Waste Products

NUMERICAL CRITERIA	PARAMETERS WHICH APPEAR IN ANALYSIS MODELS	RANKING OF PARAMETERS BY PRIORITY FOR OBTAINING DATA	
1. Limits on pre-waste emplacement groundwater travel time [10 CFR 60.113(a)(2)]	from repository horizon to water table and along flow path to accessible environment (Prow Pass), for each unit, N, d, K_s, ε, $\bar{b}$ for present conditions, q	$q/K_s < 1.0$ 1 - 1 2 - d 3 - N_e 4 - K_s	$q/K_s \geq 1.0$ 1 - $\bar{b}$ 2 - d 3 - K_s
2. Limits on waste package containment time [10 CFR 60.113(a)(1)(ii)(A)]	are presently working on	No ranking possible: first priority should be given to data on canister-wall attack mechanisms and their roles; secondly, investigations of resaturation of rock matrix after thermal pulse.	
3. Limits on release rates from engineered barrier system [10 CFR 60.113(a)(1)(iii)(B)]	for present and future conditions (after heat pulse), q, A, S, $M_i(o)$, $\bar{T}$, σ^2, $T_{1/2}$	1 - S 2 - A 3 - q (T_c and σ^2 not ranked)	
4 Limits on cumulative releases to the accessible environment [10 CFR 60.112 in Ref. to 40 CFR 191.13]	from repository to water table for present and future conditions, and to accessible environment, q, A, S, R_f, N_e, d, K_s, $\bar{b}$, k physical constants and design quantities, a, $M(o)$, n, λ, T_c	For long half-lived nuclides 1 - q 2 - R_f 3 - d	