

Sandia National Laboratories

Albuquerque, New Mexico 87185

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LPDR B, N, S

Ms. Sandra Wastler
Repository Projects Branch
Division of Waste Management
U.S. Nuclear Regulatory Commission
7915 Eastern Avenue
Silver Spring, MD 20910

Distribution:

Wastler
SH11
(Return to WM, 623-SS)

Team-Ticket
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Dear Ms. Wastler:

Enclosed is the summary of activities during June 1986 for the following tasks (A-1165): (I) Assisting in the Development of the Licensing Assessment Methodology (II) Monitor and Review Aspects of DOE programs; (III) Identifying Techniques for Probability Assignments; and (IV) Short Term Technical Assistance.

Sincerely,

Robert M. Cranwell

Robert M. Cranwell, Supervisor
Waste Management Systems
Division 6431

RMC:6431:jm

Enclosure

Copy to:

Office of the Director, NMSS
Attn: Program Support
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Division of Waste Management
Seth Coplan
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A-1165 PDR

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Campbell, J. E., D. E. Longsine, and M. Reeves, 1980, Risk Methodology for Geologic Disposal of Radioactive Waste: The Distributed Velocity Method of Solving the Convective-Dispersion Equation, SAND80-0710, NUREG/CR-1376, SNLA, 66 p.

Helton, J. C., J. B. Brown, and R. L. Iman, 1980, Risk Methodology for Geologic Disposal of Radioactive Waste: Asymptotic Properties of the Environmental Transport Model, SAND79-1908, NUREG/CR-1636, Vol. 3, SNLA, 165 p.

Pepping, R. E., and M. S. Chu, 1981, Risk Analysis Methodology for Spent Fuel Repositories in Bedded Salt: Methodology Summary and Differences Between Spent Fuel and High-Level Waste, SAND81-0396, NUREG/CR-2208, SNLA, 44 p.

Pepping, R. E., M. S. Y. Chu, K. K. Wahi, and N. R. Ortiz, 1983, Risk Analysis Methodology for Spent Fuel Repositories in Bedded Salt: Final Report, SAND81-2409, NUREG/CR-2402, SNLA, 90 p.

Reeves, M., D. S. Ward, N. D. Johns, and R. M. Cranwell, 1986, Data Input Guide for SWIFT II, The Sandia Waste-Isolation Flow and Transport Model for Fractured Media, Release 4.84, SAND83-0242, NUREG/CR-3162, SNLA, 144 p.

Runkle, G. E., R. M. Cranwell, and J. D. Johnson, 1981, Risk Methodology for Geologic Disposal of Radioactive Wastes: Dosimetry and Health Effects, SAND80-1372, NUREG/CR-2166, SNLA, 46 p.

Runkle, G. E., and N. C. Finley, 1983, Dosimetry and Health Effects Self-Teaching Curriculum, NUREG/CR-2422, SAND81-2488, NRC, 111 p.

These ten reports, combined with the twelve previously completed, make up about two-thirds of the total NRC LAM documentation; however, several DOE reports may also have to be examined. Both Aerospace and Golder have recommended that DOE and other codes such as WAPPA and ORIGEN be included in the LAM. Currently no NRC documentation is available on these codes.

PROGRAM: Monitor/Review Aspects of DOE FIN#: A-1165
& other National and Inter- Task II
national Waste Management
Programs

CONTRACTOR: Sandia National Laboratories BUDGET PERIOD: 10/85-
9/86

NMSS PROGRAM MANAGER: S. Wastler BUDGET AMOUNT: \$80K

CONTRACT PROGRAM MANAGER: R. M. Cranwell FTS PHONE: 844-8368

PRINCIPAL INVESTIGATORS: R. L. Hunter FTS PHONE: 846-6337

PROJECT OBJECTIVES

To monitor and review the performance-assessment aspects of DOE and other national and international waste management programs.

ACTIVITIES DURING JUNE 1986

During June we prepared recommendations for review of the DOE report "Multiattribute Utility Analysis of Sites Nominated for Characterization for the First Radioactive-Waste Repository--A Decision-Aiding Methodology" (DOE/RW-0074). Our comments were submitted to Wayne Walker on June 10. Some aspects of the techniques need more detailed explanation. Dr. Steve Hora, a consultant to Sandia from the University of Hawaii, has been asked to comment on this report. Dr. Hora has a background in statistics and operations research and has published in the area of utility theory. Dr. Hora's resume was requested by NRC and is forthcoming.

PROGRAM: Probability Techniques

FIN#: A-1165
Task III

CONTRACTOR: Sandia National Laboratories BUDGET PERIOD: 10/85-
9/86

NMSS PROGRAM MANAGER: S. Wastler BUDGET AMOUNT: \$163K

CONTRACT PROGRAM MANAGER: R. M. Cranwell FTS PHONE: 844-8368

PRINCIPAL INVESTIGATORS: R. L. Hunter FTS PHONE: 846-6337

PROJECT OBJECTIVES

To identify techniques for assigning probabilities to geologic processes and events.

ACTIVITIES DURING JUNE 1986

The experts continued to work on the preparation of new chapters and on review of the draft report, but no Sandia staff work was done on this task in June. Cornell, Wahi, and Holland report that their chapters should be submitted to us during the first week in July. This is slightly later than we had hoped.

S. Wastler informed R. Hunter by telephone that the nature of NRC's comments on the draft report may require additional work, not in the current program plan. This will require that the September due date for the final version of the report be pushed back.

PROGRAM: Short-Term Technical Assistance FIN#: A-1165
Task IV

CONTRACTOR: Sandia National Laboratories BUDGET PERIOD: 10/85-
9/86

NMSS PROGRAM MANAGER: S. Wastler BUDGET AMOUNT: \$50K

CONTRACT PROGRAM MANAGER: R. M. Cranwell FTS PHONE: 844-8368

PRINCIPAL INVESTIGATORS: R. L. Hunter FTS PHONE: 846-6337

PROJECT OBJECTIVES

To provide general technical assistance on waste-management matters on the request of the NMSS PM.

ACTIVITIES DURING JUNE 1986

No activity.

General Comments

1. The purpose of this report needs to be determined. Based on the title, this report should be the description of a decision-aiding methodology. The report is more than a description or demonstration of a methodology. On page 2-3, paragraph 2, the six basic steps of the methodology amount to a performance assessment. This report is not a performance assessment. In the recommendation report for site characterization (DOE, 1986), the purpose of this earlier report is described as an aid in determining the preferred sites for recommendation for characterization. The ranking schemes based on various combinations of criteria do not seem to have been expressly followed in the DOE selection.
2. The multiattribute utility analysis (MUA) has been applied to the siting of engineered facilities such as power plants, dams, and refineries (p.2-1). These previous uses should be evaluated as to whether they are analogous to a nuclear-waste disposal site. This evaluation should concentrate on the extent the engineered facility is involved in the earlier studies and the difference in time frame that must be considered. An MUA may not be usable because of the sparsity or lack of data for longer time frames.
3. By assigning rating values to two decimal points to each site, a false image of precision is indicated, considering the methodology is based on the Delphi technique. In addition, the differentiation between sites, each of which would be a suitable site by this analysis, could cause problems when pressure is applied to pick "the best" site. Would a methodology that distinguished between acceptable and unacceptable sites be more efficient in the long run?
4. Because of the questions about and comments on this report, a detailed review of the techniques (MUA, Delphi) used, the data and information obtained, and conclusions for at least the postclosure sections is recommended.

Recommendations

Postclosure (chap. 3 and Appendices B, C, D, and G)

1. Scenarios

- a. The scenario selection procedure should be reviewed in order to determine the completeness of the selected scenarios.

- b. An evaluation should be done as to whether more information on the site could be obtained by breaking-up Scenario 1 (nominal conditions) into scenarios with more restricted conditions. In the report, Scenario 1 contains all expected conditions - base case, conditions resulting from construction, conditions resulting from the thermal effects of the waste, canister corrosion, and future climatic changes. Each additional feature consists of the conditions of Scenario 1 plus an additional feature.
- c. Scenario probabilities should be evaluated as to reasonableness.

2. Site Scoring (section 3.4)

- a. The applicability of this scoring technique needs to be evaluated.

The range of median travel times in Figures 3-3 and 3-4 may not be applicable to all of the sites. Too little is known about most of the sites to assume that each or any can have a 200,000 year median travel time.

The range of cumulative releases and the relationship between cumulative release and site properties (including median travel time) are highly speculative. Both the range and relationship are of critical importance in determining the expected utility of each site.

3. Multiattribute Utility Functions

- a. This method of assigning a utility value to each site needs to be assessed to make certain that site differences are adequately represented.
- b. For the multiattribute utility, the single-attribute utilities for each of the scenarios are combined. In this process, low probability, but credible, scenarios may be masked by being combined with high probability scenarios. This procedure should be evaluated to determine if important site-specific information is being lost.

4. Results and Sensitivity Analysis

- a. Multiattribute-utility data in paragraph 4 of p. 3-28 reinforces the comment of 3a above. Both Davis Canyon and Richton Dome have multiattribute utilities of 99.99. Hanford rates a 99.76 even though this value

corresponds to releases 22 times greater than the releases for a 99.99 utility. Does this technique adequately distinguish between sites?

- b. Nine parameters were varied in the sensitivity analysis. These parameters should be examined to determine what they reveal about the sites. In addition, could variations in other parameters be as or more revealing?

Preclosure (Chap. 4, Appendices E and F)

1. Performance Measures

- a. The objectives, corresponding performance measures, and impact levels need to be checked for completeness. Are the impact levels adequately defined and appropriate for the candidate sites?

2. Descriptions of Possible Site Impacts

- a. The possible site impacts should be examined for completeness.

3. Multiattribute Utility Function

- a. The function (p. 4-17) needs to be evaluated as to appropriateness.
- b. The heart of this section is Table 4-7 (p. 4-19). Two parts of the table that should be critically evaluated are the range in impact values for each performance measure and tradeoff value.

Is the tradeoff value, whereby all impacts and effects of the performance measures are reduced to dollar amounts, a reasonable method to evaluate the sites?

4. Evaluation of the Nominated Sites

- a. This section should be reviewed for the reasonableness of the component disutilities for each site.

5. Sensitivity Analyses

- a. Is adequate variability included in the parameters and is the rational used in the selection of the variability reasonable?

Composite Analysis (chap. 5)

- a. This chapter contains plots of composite utility values based on eight sets of conditions.

An evaluation of whether the eight sets of conditions provide for the full range of options for composite ranking should be made.

Reference

DOE, 1986, Recommendation by the Secretary of Energy of candidate sites for site characterization for the first radioactive-waste repository: U.S. Dept. Energy, Rept. DOE/S-0048, 9 p.

A-1165, Task I
1183.010
June 1986

THIS IS AN ESTIMATE ONLY AND MAY NOT MATCH THE INVOICES SENT TO
NRC BY SANDIA'S ACCOUNTING DEPARTMENT.

	Current Month	Year-to-Date
I. Direct Manpower (man-months of charged effort)	0.6	3.4
II. Direct Loaded Labor Costs	6.0	39.0
Materials and Services	0.0	0.0
ADP Support (computer)	0.0	0.0
Subcontracts	2.0	42.0
Travel	0.0	2.0
Other	0.0	1.0
TOTAL COSTS	8.0	84.0

Other = rounding approximation
by computer

III. Funding Status

Prior FY Carryover	FY86 Projected Funding Level	FY86 Funds Received to Date	FY86 Funding Balance Needed
50K	200K	150K	None

A-1165, Task II
 1183.020
 June 1986

THIS IS AN ESTIMATE ONLY AND MAY NOT MATCH THE INVOICES SENT TO
 NRC BY SANDIA'S ACCOUNTING DEPARTMENT.

	Current Month	Year-to-Date
I. Direct Manpower (man-months of charged effort)	0.0	0.2
II. Direct Loaded Labor Costs	0.0	2.0
Materials and Services	0.0	0.0
ADP Support (computer)	0.0	0.0
Subcontracts	1.0	22.0
Travel	0.0	0.0
Other	0.0	-1.0
TOTAL COSTS	1.0	23.0

Other = rounding approximation
 by computer

III. Funding Status

Prior FY Carryover	FY86 Projected Funding Level	FY86 Funds Received to Date	FY86 Funding Balance Needed
-0-	80K	80K	None

A-1165, Task III
 1183.030
 June 1986

THIS IS AN ESTIMATE ONLY AND MAY NOT MATCH THE INVOICES SENT TO
 NRC BY SANDIA'S ACCOUNTING DEPARTMENT.

	Current Month	Year-to-Date
I. Direct Manpower (man-months of charged effort)	0.0	4.3
II. Direct Loaded Labor Costs	0.0	47.0
Materials and Services	0.0	0.0
ADP Support (computer)	0.0	0.0
Subcontracts*	4.0	75.0
Travel	0.0	1.0
Other	<u>0.0</u>	<u>0.0</u>
TOTAL COSTS	4.0	123.0

Other = rounding approximation
 by computer

III. Funding Status

Prior FY Carryover	FY86 Projected Funding Level	FY86 Funds Received to Date	FY86 Funding Balance Needed
143K	163K	20	None

*Charges were received for Gutjahr, Callender, and Baecher.

A-1165, Task IV
1183.040
June 1986

THIS IS AN ESTIMATE ONLY AND MAY NOT MATCH THE INVOICES SENT TO
NRC BY SANDIA'S ACCOUNTING DEPARTMENT.

	Current Month	Year-to-Date
I. Direct Manpower (man-months of charged effort)	0.0	2.9
II. Direct Loaded Labor Costs	0.0	35.0
Materials and Services	0.0	1.0
ADP Support (computer)	0.0	0.0
Subcontracts	0.0	1.0
Travel	0.0	3.0
Other	<u>0.0</u>	<u>0.0</u>
TOTAL COSTS	0.0	40.0

Other = rounding approximation
by computer

III. Funding Status

Prior FY Carryover	FY86 Projected Funding Level	FY86 Funds Received to Date	FY86 Funding Balance Needed
-0-	50K	50K	None

A-1165

TOTAL FOR 1183.010, 1183.020, 1183.030, 1183.040

June 1986

THIS IS AN ESTIMATE ONLY AND MAY NOT MATCH THE INVOICES SENT TO
NRC BY SANDIA'S ACCOUNTING DEPARTMENT.

	Current Month	Year-to-Date
I. Direct Manpower (man-months of charged effort)	0.6	10.8
II. Direct Loaded Labor Costs	06.0	123.0
Materials and Services	0.0	1.0
ADP Support (computer)	0.0	0.0
Subcontracts	7.0	140.0
Travel	0.0	6.0
Other	0.0	0.0
TOTAL COSTS	13.0	270.0

Other = rounding approximation
by computer

III. Funding Status

Prior FY Carryover	FY86 Projected Funding Level	FY86 Funds Received to Date	FY86 Funding Balance Needed
193K	493K	300K	None