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30 August 1984  
Ref. No. 1148-005-049

WM-RES  
WM Record File  
D1004  
EI

WM Project 10-11  
Docket No. \_\_\_\_\_  
PDR   
LPDR

Waste Management Engineering Branch  
Division of Waste Management  
U.S. Nuclear Regulatory Commission  
7915 Eastern Avenue  
Silver Spring, MD 20910

Distribution:  
J Buckley  
John - T. [unclear]  
(Return to WM, 623-SS)

Attention: Mr. John Buckley, Mail Stop 623-SS

Subject: Contract No. NRC-02-84-002, Task Order 005 Document Reviews

Dear Mr. Buckley:

Enclosed are our reviews of NUREG/CR-1065, Vols. I and II, dated March 1983, and BWIP FS-1, dated February 9, 1983. We are still awaiting receipt of RHO-BW-SA-294P, Microcharacterization of Basalt - Considerations for a Nuclear Waste Repository, from Rockwell Hanford Operations. We will review the draft BWIP EA after receiving authorization from you.

Please let me know when we can meet to discuss the document reviews and our comments on the draft BWIP EA.

Sincerely,

ENGINEERS INTERNATIONAL, INC.

V. Rajaram  
Assistant Project Manager

VR/ja

Enclosure

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### EI Document Review Sheet

DOCUMENT: NUREG/CR-3065, Vols. I and II, In Situ Test Programs Related to Design and Construction of High-Level Nuclear Waste (HLW) Deep Geologic Repositories, Golder Associates, Bellevue, WA, March 1983.

REVIEWER: V. Rajaram

DATE REVIEW COMPLETED: August 27, 1984

#### SIGNIFICANCE TO NRC WASTE MANAGEMENT PROGRAM:

The report presents a defensible rationale for selecting in situ test programs at geologic repositories proposed in basalt, tuff, domal and bedded salt, and granite. Tests which are available for satisfying media/site specific information needs are identified, and their capability in reducing data uncertainties is assessed. Recommendations are provided for improving existing in situ tests, development of new or hybrid tests, and integration of the in situ program into the repository development program.

This report forms a background for the review of the DOE Site Characterization plans (SCP) by the NRC. However, site specific design information needs and cost/schedule limitations prior to SCP submittal must be considered before NRC can review the in situ testing programs described by DOE in their SCP's.

#### BRIEF SUMMARY OF DOCUMENT:

The report summarizes the tests available for designing media/site specific in situ test programs for geologic repositories in the following media:

- basalt at Hanford, Washington
- tuff at Yucca Mountain, Nevada Test Site
- domal salt at specific Gulf Coast sites
- bedded salt at an unspecified site
- granite at an unspecified site

A rationale for the test selection process is presented and consists of:

- establishing the information needs for construction authorization

- assessing the relevant capabilities of available tests
- matching the capabilities of specific tests to the perceived information needs.

Critical engineering variables, which in conjunction with the site will determine repository system performance, have been identified using the following steps:

- primary engineering variables affecting repository design and construction have been identified
- a qualitative assessment is made of the influence of these variables on the level of confidence in satisfactory repository performance
- variables which have a significant potential impact, in conjunction with a capability for change at reasonable cost, have been identified.

Key issues that impact the choice of values for the critical engineering variables are identified, and include:

- constructibility
- thermal response
- mechanical response
- hydrological response
- geochemical response

Significant characteristics that affect the resolution of these key issues are identified, and reasonable in situ test programs to measure these characteristics are recommended. It is concluded that the assessment of site characteristics and verification of predictive numerical models should be on a continual basis, with the primary objective of reducing uncertainty in meeting the repository performance criteria.

The appendix describes eleven (11) tests that are presently available for determining significant characteristics. Each test is evaluated, a test program is suggested, media-specific aspects of the test are discussed, and potential advancement in the state-of-the art is briefly mentioned. The tests described are:

- (1) plate test, (2) block test, (3) chamber test,
- (4) mine-by test, (5) heater test, (6) tracer test, (7) multiple borehole permeability test,

(8) overcoring test, (9) flatjack test, (10) acoustic emission monitoring, and (11) exposure mapping.

PROBLEMS, DEFICIENCIES, OR LIMITATIONS OF REPORT:

1. It is a well written report detailing an approach to in situ testing, and assessing the capabilities of currently available tests in satisfying the information needs for resolving key repository design and performance assessment issues. However, the manner in which results from the in situ test program may be extrapolated to repository-wide conditions is not mentioned.
2. The manner in which the data from the various tests can be integrated for use in repository design and performance assessment is not discussed.

## EI DOCUMENT REVIEW SHEET

DOCUMENT: Dowell Division of Dow Chemical Company, "Basalt Waste Isolation Project (BWIP) ES-1 Sealing Considerations," February 9, 1983

REVIEWER: A. Mukherjee

DATE APPROVED: 30 August 1984, V. Rajaram

DATE REVIEW COMPLETED: 30 August 1984

### SIGNIFICANCE TO NRC WASTE MANAGEMENT PROGRAM:

This report documents the present experience with seal materials that are proposed for the BWIP exploratory shafts (ES). Since the seals are the main barriers against migration of ground water and transport of radionuclides, their properties and characteristics must be known.

### BRIEF SUMMARY OF DOCUMENT:

Two materials for shaft sealing at BWIP have been proposed by Dowell, namely Regulated Fill Up Cement (RFC) and Chemical Seal Ring (CSR). The RFC is an expansive cement and the CSR is designed to be installed above and below water bearing zones to inhibit vertical migration of ground water.

Several case histories for the use of RFC and CSR have been mentioned, since their inception in 1967 and 1964, respectively. It is concluded that, based on Dowell experience, no reasons are foreseen as to why these proposed BWIP shaft seal materials would not be stable during the life of a nuclear waste repository (75 to 100 years).

### PROBLEMS, DEFICIENCIES, OR LIMITATIONS OF REPORT

1. No information is presently available regarding the long term durability of these seal materials under continued elevated temperature conditions.
2. Experience with these materials is limited to only about 20 years, and stability for 75 to 100 years is not proven at this time.
3. Post closure performance of these seal materials is also not certain at this time, and no monitoring program for evaluating the seals is mentioned.
4. Quality assurance procedures for installation must be provided.

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