UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

July 17, 1995

MEMORANDUM TO: Barbara D. Meehan
Senior Contract Administrator
Contract Administration Branch No. 1
Division of Contracts and
Property Management
Office of Administration

THRU: Shirley L. Fortuna
CNWRA Deputy Program Manager
Program Management, Policy Development
and Analysis Staff
Office of Nuclear Material Safety
and Safeguards

FROM: Charles G. Interrante, Manager
EBS Program Element
Engineering and Geosciences Branch
Division of Waste Management
Office of Nuclear Material Safety
and Safeguards

SUBJECT: INTERMEDIATE MILESTONE, IM 20-5702-542-510, A REVIEW BY H. MANAKTALA, CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES, OF U.S. DEPARTMENT OF ENERGY REPORT, DOE-EM-0177.

References: 1. Operations Plans for the Division of Waste Management for FY94-95, EBS Section 3.5.3.3, Subtask 4.2, (Revision 5, Change 0): Waste Package Report Reviews, IM 20-5702-542-510.

2. U.S. DOE Report, DOE-EM-0177, "High-Level Waste Borosilicate Glass: A Compendium of Corrosion Characteristics."

We have reviewed the subject document and find that it is acceptable and that it satisfies the requirements of Reference 1.

The subject review was conducted under the requirement for review of waste package reports, as given under IM 20-5702-542-510 of Reference 1. Normally, documents of the Office of Civilian Radioactive Waste Management (OCRWM) are regarded as being under the U.S. Nuclear Regulatory Commission jurisdiction, and NRC is not obliged to review documents prepared by Environmental Management (EM) within the U.S. Department of Energy (DOE).

426.1
WM-11
NH16

250160
9507260047 950717
PDR WASTE
WM-11 PDR

delete: ACNW

The report of Reference 2 was prepared for EM in three volumes. As background on the purpose of this review, we note that while Reference 2 was prepared by EM, the contents of this reference are believed to be pertinent to NRC activities, as a DOE basis for repository disposal arguments, in their total systems performance assessments (TSPA) and in the subsystem performance assessment for the Engineered Barrier System (EBS). Despite this, the subject review seems to presume that NRC will license the high-level waste (HLW) glass: for example, page 1-1 uses the term "licensing of the glass waste" and page 3-6 uses "to demonstrate compliance with..." This notion of NRC licensing of glass should not be implied in the review.

We note that the funds allocated for this review were minimal in relation to the task of covering the vast area of glass research and modelling, which is encompassed by Reference 2. This review, and the task of making recommendations in numerous study areas, would not have been an easy task even for one whose lifework centers on glass research related to repository studies. In that perspective, the review is regarded to be an applaudable achievement and many aspects of the review will have significant value for the EBS program. Nevertheless, we suggest that this report be regarded as a draft until further suggested work has been completed.

A purpose of this review, is to aid in furnishing a basis for prioritization of future endeavors of CNWRA and NRC staff. The report suggests that nearly every topic related to glass performance be studied extensively, as future work. Prioritization of these recommendations, in relation to the overall objectives of the EBS program, should be done before this report is considered to be a final CNWRA report on this topic. In addition, we have enclosed herewith, suggestions for areas of clarification and suggestions for changes to be made in any revision of this report. These suggestions were developed by Dr. T. Ahn.

With these comments, including those of the enclosure, we suggest that CNWRA should plan to develop a final report. The FY96 OPS Plan should be revised, as needed, to include sufficient resources for a new task on the activities required to develop the final report.

Enclosure: As stated

cc w/encl: J. Linehan, PMDA

TICKET: CNWRA 950097
DISTRIBUTION: * w/encl.

Central File*	DWM r/f*	RJohnson	MWeber	JAustin
JHolonich	NMSS r/f*	ENGB r/f*	KMcConnell	MBell*
PUBLIC	MNataraja	DWM t/f*	BStiltenpole*	TAhn*

DOCUMENT NAME: S:\DWM\ENGB\CGI\IM542510.BDM s:\dwm\engb\tma\manak.jon

OFC	ENGB		ENGB		ENGB		PMDA			
NAME	CInterrante/jj*		RWeller*		MBell		SFortuna			
DATE	7/13/95		7/13/95		7/13/95		7/17/95		/ /95	

OFFICIAL RECORD COPY

ACNW: YES ___ NO ✓
IG : YES ___ NO ✓
LSS : YES ___ NO ✓

Delete file after distribution: Yes ___ No ✓

Specific Comments

1. The report suggests that nearly every topic related to glass performance be studied extensively, as future work. To be of greater value, the relative importance of these topics should be evaluated, perhaps by using envelope calculations. For instance, we can hardly envision significant radionuclide releases based on solubility limits, unless colloids form, and, hence, it may not be necessary to understand radionuclide partitioning of secondary phases, as suggested in Comment 16.

2. The author hints at very general "gaps in the areas of mechanisms of corrosion and completeness of the data bases for developing or validating long-term performance models" (page iii). For instance, in the one related to glass corrosion kinetics, the reviewer has comments on neither analogue studies (which have been suggested by the U.S. Department of Energy (DOE)) nor other potential methods to determine Stage 3 kinetics, and, yet, the determination of them is recommended in p 3-1. We anticipate that suggestions for future work, in this and other areas, can be more focused and explicit.

3. In page 1-1, "HLW" should be more specific as "liquid HLW."

4. In page 2-1, it is not clear how the author defines "long term" or "short term" in laboratory testings and how those terminologies are related to similar terminologies used in the repository performance. This ambiguity is prevalent throughout the review and we suggest that perhaps the terminology of ASTM C-1174-91 can be used here.

5. In page 2-2, please provide references on geochemical models discussed in Comment 3 and provide potential examples of factors to be considered in leach models that account for thermodynamically metastable phases.

6. For Comment 4 (page 2-2) and Comment 19 (page 3-15), flow-through tests are to determine matrix dissolution rates. Matrix dissolution rates are normally independent of laboratory flow rates because laboratory flow rates are intentionally very high, when compared with matrix dissolution rates or with repository flow rates. In view of this purpose of using high flow rates, it is not certain how one can identify flow-through test parameters that represent the flow conditions of the repository. These low-flow-rate tests are being conducted by DOE in their drip tests by Argonne National Laboratory. Therefore, we question the recommendation, on page 2-3, related to the identification of test parameters in this kind of test. Similarly, (see page 3-15) 150 C tests may be regarded as accelerated tests and, yet, the review recommends that the 150 C tests must be justified. These recommendations should be clarified.

7. In page 2-3, Comment 5, the reference by Manaktala, et al., is not published and must be referenced as [in press].

Enclosure

8. In page 3-4, we agree with the reviewer that the transformation from amorphous state to crystalline state is likely to continue. However, if diffusion rates are low, this may not be the case, as, for practical purposes, no transformation would be observed. At present, we do not know enough about either the diffusion rates or the related nucleation behavior.

9. In page 3-7, Comment 10 should include all manmade materials, such as grout and organics.

10. In page 3-13, we agree with Comment 17 and its recommendation. In addition, models used in TSPA-1993 (SAND93-2675) should be discussed to show current DOE practices in total system performance assessment.

11. In page 3-14, we believe that crystallization may affect dissolution, in a minor way, and your suggestion to study kinetics of crystallization would have little practical application from our view.

s:\dwm\engb\tma\manak.jon