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WM DOCKET CONTROL
CENTER

Upton, Long Island, New York 11973

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(516) 282
FTS 666 4094

Department of Nuclear Energy

June 22, 1984

WM Record File
A-3167

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Distribution:

WICK
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Mr. Everett A. Wick
High Level Waste Licensing Management Branch
Division of Waste Management
Mail Stop 965 SS
U. S. Nuclear Regulatory Commission
Washington, DC 20555

Dear Mr. Wick:

Review of MCC-D2 - One-Year Leach Test Data for SRL-131 Glass

Attached is the review you requested on the subject document. Our review shows that, in general, documentation of the raw data and the addressing of uncertainties is relatively comprehensive. However, simple glass leaching data may not be appropriate for licensing unless they can be shown to be base-line results to which more complex interactions with other package components are assessed.

Sincerely,



Peter Soo, Associate Division Head
Nuclear Waste Management Division

PS:gfs
Enclosure

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BROOKHAVEN NATIONAL LABORATORY

M E M O R A N D U M

DATE: June 22, 1984
TO: File
FROM: M. S. Davis
SUBJECT: Review of "MCC-D2-One-Year Leach Test Data for SRL-131 Glass.

In response to a request from the NRC (E. Wick to P. Soo, 6/12/84) a review of the subject document was performed. The primary emphasis of the review was to evaluate the report for completeness of documentation of data and procedures, and the adequacy of the analyses of the data, and uncertainties in the data. Comments on the applicability of the data for use in a license application are also included.

The stated goals of the work were to systematically evaluate the long-term (one year) leaching of SRL-131 glass using a standardized procedure (MCC-1) and "to verify that information and data pertinent to evaluating the tested material can be traced."

Overall, this document represents a fairly comprehensive documentation of procedures and individual test data. While the MCC-1 procedure itself was not outlined (in a document of this type they should be) references are made to the appropriate document and justification for changes in the procedure is given. Glass sample and leachate preparation procedures are given, primary data and calculated data are tabulated, graphical summaries are presented and an analysis of the precision and accuracy of the leachate analyses are presented. The error analysis of the test data (mg/L of a specie) and the normalized (calculated) elemental mass loss were described. The three primary areas where potential error in the results could occur were identified as steps in the test method, inhomogeneity in the composition of test specimens, and error or uncertainties in analyses of the leachate solutions. The last two sources of error were considered in detail.

Without a detailed, independent analysis of the data presented, it cannot be stated that this analysis of the error is correct or adequate. The primary point, however, is that this report does present details of both primary and calculated data with an assessment of errors present in the data. As such, it represents an admirable attempt at documenting and analyzing data that should be emulated in other portions of the DOE program. Documents of this type would be even more useful if the authors/DOE specify the relevance of the data and uncertainties in the data with respect to licensing. This is a major omission in the study. The tests conducted represent single component tests at a single temperature, no radiation, and a single glass composition SRL-131 (although some data are present for comparison on MCC 76-68 glass). The critical information needed to evaluate controlled release from the engineered

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barrier system (EBS) is the variation with time in radionuclide concentration of the water leaving the EBS. Such changes in radionuclide content in repository water over 10,000 years are determined by a large number of coupled factors, including:

- a) Temperature changes with time
- b) Radioactive decay and chemical interaction with materials in the repository (corrosion, diagenesis of packing materials, etc.)
- c) Formation and destruction of radionuclide bearing colloids and suspensions, resulting from temperature and chemical changes with time
- d) Radionuclide solubility changes due to temperature and chemical changes in the repository water with time
- e) Changes due to varying flow rates (permeability and diagenetic changes in packing).

Another important factor that needs to be addressed with respect to glass leaching and radionuclide migration is that there is no evidence to demonstrate that the geometry of the waste package materials will remain unchanged over 10^4 years. It is highly likely that release of radionuclides over 10^4 years will occur in an environment containing highly divided and mixed materials such as:

- corrosion products
- unreacted canister metals
- packing material in its original and degraded forms
- high surface area borosilicate glass or spent fuel
- water chemistry associated with 1000 years of radiolysis and perhaps enhanced concentration of the groundwater salts due to temporal temperature changes, etc.

Unless simple glass leaching data can be shown to form a relevant baseline for quantifying these complex interaction effects, further glass leaching work, such as that described in the subject report, will prove to be of limited usefulness to the licensing process.

MSD:gfs