UNITED STATES DEPARTMENT OF COMMERCE
National Bureau of Standards
Gaithersburg, Maryland 20899

March 21, 1986

Mr. Everett A. Wick
Division of Waste Management
Office of Nuclear Materials Safety and Safeguards
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Re: Monthly Letter Status Reports for November 1985 (FIN-A-4171-5) and December 1985 (FIN-A-4171-6)

Dear Mr. Wick:

Enclosed are two monthly progress reports for the project entitled "Evaluation and Compilation of DOE Waste Package Test Data." The financial information is reported separately. Please note that the progress reports for the months January and February are in preparation and will be forwarded later this month.

A biographical sketch of Dr. Walter Liggett, Jr., a statistician who will be working on this program, is attached for your information.

Sincerely,

Charles G. Interrante
Program Manager
Corrosion Group
Metallurgy Division

2 Enclosures

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Monthly Letter Report for November, 1985

Published March 1986

(FIN-A-4171-5)

Performing Organization: National Bureau of Standards
Gaithersburg, MD 20899

Sponsor: Nuclear Regulatory Commission
Office of Nuclear Materials Safety and Safeguards
Silver Spring, MD 20910

On November 20, NBS submitted its proposal, "Evaluation and Compilation of DOE Waste Package Test Data," FIN A-4171-6, in response to a request from NRC dated October 21, 1985.

TASK 1: Review of Waste Package Data Base

1.1. Leaching of Glass

In efforts aimed at the establishment of a competent group of reviewers for the report on leaching titled "Final Report of the Defense High-Level Waste Leaching Mechanisms Program", meetings were held in both October and November in Corning, New York.

On October 17, Dr. C. Interrante (NBS) met with Corning Glass Works representatives, Dr. Joseph Malmendier, Manager, Technology Development, and Mr. P. Bruce Adams, Senior Scientist, Corporate Systems, to explore the possibilities for interactions between NBS and Corning workers and to discuss the magnitude of the effort that might be required to furnish the desired review of the report. In these discussions, various topics were explored.

A dominant conclusion was that the document in question would have to be reviewed on a chapter-by-chapter basis, and the Corning representatives indicated that, while Corning does have an interest in having their staff participate in the review process, they might not be the best reviewers for the entire document. Considering the level of expertise needed for this task, reviewers of selected chapters might be more judiciously selected, perhaps from professors at universities nearby Corning. One suggestion was that the professors might serve in a combined effort with the workers from Corning. Both Alfred and Cornell Universities were mentioned as having staff with appropriate experience.

The discussions ended with many unanswered questions and it was decided that these subjects could be addressed more fully only after a second meeting, which was tentatively set to coincide with the American Ceramic Society's scheduled meeting of the Glass Division, which was to be held during November 6-8, 1986 in Corning, New York. This would open possibilities for interacting with a number of the technical experts, whom we might want to consider for participation, e.g. professors from both Alfred and Cornell Universities and others who would be at the ACerS Glass Division meeting.

At this October meeting, Corning graciously arranged to satisfy Dr. Interrante's request to tour appropriate laboratory facilities on short notice. A tour was arranged and this afforded him opportunities to meet with various members of the technical staff and to make observations on the quality of their extensive research and development activities related to glass.

In conjunction with the November meeting of ACerS at the Corning Hilton Inn, three meetings were held to further explore our review of the leaching document mentioned above. On the morning of November 7th, E. Wick (NRC) and C. Interrante met with the above mentioned members of the Corning staff to plan activities for that afternoon and the following day, and to discuss problems associated with an interaction of the type proposed. An outline of presentations was developed for an afternoon meeting with selected invited guests. We met again the next day to finalize our plans and to discuss contractual questions with Fredric Quan, Manager of Research Contracts, Research and Development Division, Corning Glass Works. At that meeting it was pointed out that procedures for award of a government contract to Corning would be very time consuming, taking as much as 5 months from the time that a proposal was received, and that it may take 3 or more months just to finalize a proposal. Details, such as those concerning the manner in which charges for services of Corning staff and others, and questions of conflict of interest, would have to be resolved in the coming months.

That afternoon a meeting was held to review the problem and to answer questions of potential participants. Those in attendance included the Corning, NBS, and NRC workers mentioned above, as well as Dr. D. Pye (Alfred U.), Dr.J. Bird (Cornell U.), Dr. S. Freiman (NBS), Mr. M. P. Teter (Corning).

Mr. Adams opened with discussions of the afternoon's agenda, and an overview of the problem in respect to the functional relationships, between DOE, NRC, NBS, the various writers of the document, and those who would be involved in the review of that work. Potential participants were introduced. Mr. Wick followed with background information on the NRC responsibility, a discussion of the regulatory requirements for containment and for release after containment (Para 60.113 of 10 CFR 60). Dr. Interrante discussed the review process, the expected lengths of the reviews, the key technical issues, and the form used to contain the reviewers findings; and then he briefly showed the waste-package conceptual designs, with emphasis on the role of glass.

Various questions from the floor were handled during and after these presentations. The liability of participants in relation to license litigation, and conflict of interest were two important areas discussed for potential reviewers.

In conjunction with the meetings discussed above, C. Interrante, and E. Wick attended selected sessions of the American Ceramics Society Glass Division Meeting, Corning, NY, November 6-8.

1.2. Expert on Zirconium and its Alloys

An expert in Zircaloy has been located and his assistance is under consideration pending NRC approval of his suitability, from the view of any potential conflicts of interest.

1.3. Approval of NBS Reviews

On November 20, 1986, C. Interrante met with members of the NBS Washington Editorial Review Board (WERB) to discuss NBS policy and to establish procedures for approval of formal reviews conducted under this contract. This level of approval is being considered for any reviews that are intended for use as published documents, i.e. as contents of a data file or as part of a hard-copy collection of reviews.

1.4. SRP

Fifteen Salt Repository Project (SRP) reports were received; two were identified by NRC as requiring formal review and the other 13 were identified as background material on the SRP. The status of the two formal reviews follows.

(1) The report by G. Jansen, "Expected Waste Package Performance for Nuclear Waste Repositories in Three Salt Formations," BMI-ONWI-623SS, was reviewed by an appropriate NBS worker prior to the Joint NRC/SRP Waste Package Workshop in Columbus, Ohio, January 22-24, 1986.

(2) The other report, "Very Rough Preliminary Estimate of the Colloidal Sodium Induced in Rock Salt by Radioactive Waste Canister Radiation," by P.W. Levy and J.A. Kierstead, will be assigned for review when a suitable reviewer is identified.

1.5. NNWSI

Of the Nevada Nuclear Waste Storage Investigations (NNWSI) reports recieved to date, ten reports have been identified for review. The eight listed below are currently under review. Some of these reviews were required by the NRC and others were

initiated (as early as September 26, 1985) by the NBS in an effort to standardize the contents of each part of the review form recommended by the NRC.

1. "NNSWI Test Plan for Copper and Copper-Base Alloys," Attachment 2 to MRB-0418 (LLNL).

2. "Behavior of Stressed and Unstressed 304L Specimens in Tuff Repository Environmental Conditions," UCRL-91804 Preprint (Uhas, McCright, Garrison).

3. "Corrosion Behavior of Carbon Steels Under Tuff Repository Conditions," McCright & Weiss, UCRL-90875.

4. "An Overview of Low Temperature Sensitization," Fox & McCright, UCRL-15619.

5. "Electrochemical Determination of the Corrosion Behavior...High Level Nuclear Waste in Tuff," Glass, et al., UCID-20174.

* 6. "LLNL NNSWI Program: List of Planned Field and Laboratory Tests," L. B. Ballou and R. D. McCright LLNL attachments 1 and 2 to letter dated 8 March 1985 to Steindler, Argonne, National Laboratory, submitted for use by DOE's ad-hoc corrosion panel of MRB.

7. "Metallurgical Analysis of a 304L Stainless Steel Canister from the Spent Fuel Test," Weiss, et al., UCID-20436.

8. "Spent Fuel Cladding Corrosion under Tuff... Observations," M.D. Smith and V.M. Oversby, UCID-20499, June '85 (LLNL).

* Formal review submittal to NRC is not planned for this item.

Two NNWSI reports for which reviews have not been initiated follow:

"Potential Corrosion and Degradation Mechanisms of Zircaloy Cladding...in a Tuff Repository", Rothman, Attachment 10 to MRB-0418/UCID-20172.

"Laboratory Experiments Designed to Provide Limits on the Radionuclide Source Term for the NNWSI Project", Oversby and McCright, UCRL-91257.

1.6. BWIP -- No documents have been recieved at NBS to date.

TASK 2: Data File for Waste Package Performance Analysis

It has become clear that the process of establishment of a data file will require that we understand and agree on the contents of the various fields of information to be stored. This work, discussed below, is being done concurrently with work on the establishment of a file structure used to store and retrieve data, and work on the evaluation of database management systems that are commercially available for use on the IBM-PC microcomputers, which will be proposed for use in the establishment of this data file.

The initial NBS experience with the review process and the use of the NRC recommended form for reviews led to differences on the types of information that are to be included in the various parts of the review form. These differences are being resolved in meetings of reviewers and a contractor C. Messina. A set of unambiguous instructions are being developed to permit a technical expert, even one who may be unfamiliar with our review process, to furnish useful reviews for inclusion in our database. The process of developing these instructions was initiated during this month and is expected to continue until about 20 reviews have been completed.

Messina completed the first phase of the contract for the development of a database in support of the HLW program effort, and delivered a written description of the architecture for the proposed NBS HLW database. Messina attended weekly meetings with NBS HLW Program team members to introduce a list of data elements and to obtain team members' input for subsequent versions. Hard copies of the preliminary lists have been provided and are being updated with input from team members on a continuing basis.

TASK 3: General Technical Assistance

Written comments on our review of the following report were forwarded to E. Wick (NRC) last month. "Repository Environmental Parameters Relevant to Assessing the Performance of High-Level Waste Packages in Basalt, Tuff, and Salt", NUREG/CR4134. Our review of a missing part received this month, Appendix D, will be furnished after it has been completed, probably in December. During this month, NBS views on a specific question were considered and the response was made by telephone to K. Chang (NRC).

Monthly Letter Report for December 1985

Published March 1986

(FIN-A-4171-6)

Performing Organization: National Bureau of Standards
Gaithersburg, MD 20899

Sponsor: Nuclear Regulatory Commission
Office of Nuclear Materials Safety and Safeguards
Silver Spring, MD 20910

NRC formally accepted the NBS proposal for FIN A-4171-6, and transmitted authorization for NBS acceptance on December 3, 1986.

TASK 1 - Review of Waste Package Data Base

Two NNWSI/tuff reports were assigned for formal review:

(1) "Laboratory Experiments Designed to Provide Limits on the Radionuclide Source Term for the NNWSI Project," by V.M. Oversby and R.D. McCright, UCRL-91257, November 1984.

(2) "FY 1985 Status Report on Feasibility Assessment of Copper-Base Waste Package Container Materials in a Tuff Repository," by R. D. C. McCright, September 1985.

NNWSI

The following NNWSI report has been identified for review and a review has not yet been initiated:

"Derivation of a Waste Package Source Term for NNWSI from the Results of Laboratory Experiments," by Virginia M. Oversby and Charles N. Wilson, UCRL-92096, September 1985.

The SRP report by Jansen mentioned in the November monthly progress report is receiving further review.

BWIP

While we have not received any reports for the BWIP/basalt category, Rockwell-Hanford has provided the documents/data accession list for the BWIP activity. We expect to select and request various reports from Rockwell-Hanford in the near future.

Compilation

Contractor C. Messina presented a skeleton of a reviewers form, which was examined by reviewers during this month. The intent is to refine this skeletal version and to develop a working form, with a set of instructions, that will be suitable for use by NBS and other reviewers working under this contract.

In addition, Messina provided a first-run hard-copy listing of bibliographic citations, which was developed using the DBMS Revelation, for use in the HLW database and she participated, along with the program manager, C. Interrante, and the analyst for database systems and hardware, Charles Sheppard, in drafting a second draft of the requirements analysis report.

TASK 2 - Identification of Additional Data Required and Identification of Tests to Generate the Data.

On December 5, 1985, a potential candidate for the NBS HLW project, F. A. Kuchinski, Rutgers University, gave a seminar at NBS entitled "Effect of Pb on Leach Rate of Borosilicate Glass." Mr. Everett Wick (NRC) was among the attendees.

C. Interrante attended only selected sessions of a Sandia/DOE-sponsored Materials Technology Seminar" held at NBS on December 11-12, 1985. While this work was observed to have only peripheral pertinence to our present studies, a copy of the slides presented at the meeting is being retained for reference. This seminar focused on the use of ductile cast iron, and brittle fracture technology applied to this material for construction of nuclear spent-fuel casks.

TASK 3 - General Technical Assistance

In response to an NRC request for short-term technical assistance, NBS reviewed Appendix D of the draft report, "Repository Environmental Parameters Relevant to Assessing the Performance of High-Level Waste Packages in Basalt, Tuff, and Salt., NEUREG/CR4134, and transmitted comments to NRC on December 11, 1985.

On December 17, 1986 at the Wilste Building, C. Interrante attended a DOE presentation of their activities on equipment for consolidation of spent fuel rods, in which a consolidation system for repository and MRS sites was discussed.

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OBJECTIVE

To provide the statistical expertise necessary to achieve objectives in engineering and the physical sciences.

QUALIFICATIONS

A Ph.D. statistician with 20 years experience consulting on a wide variety of problems largely in the physical sciences and engineering but also in the biological and social sciences. Knowledgeable in the design of experiments and surveys, various approaches to statistical inference, multivariate analysis, time series analysis, and computer graphics. Capable of developing statistical methodology for special problems.

EXPERIENCE

NATIONAL BUREAU OF STANDARDS, Gaithersburg, MD (1979-present). Consultation and research on the statistical assessment of measurement error. Applications to Nuclear Safeguards, the certification of reference materials, the calibration of instruments, and the study of environmental pollutants. Statistical analysis of the physical sampling that accompanies chemical measurements. Reviews of technical material from NBS and other Federal agencies. Use of microcomputers for word processing and statistical computing.

TENNESSEE VALLEY AUTHORITY, DIVISION OF ENVIRONMENTAL PLANNING, Chattanooga, TN (1975-1979). Responsible for statistical consulting to researchers studying the effects of energy production. Subject matter areas included air quality, water quality, aquatic biology, industrial hygiene, and occupational safety Developed statistical consulting in the division, recruited other statisticians, and obtained software and training.

UNIVERSITY OF TENNESSEE AT CHATTANOOGA, Chattanooga, TN (1976-1978). Taught introductory statistics to sophomores and MBA students in the Department of Business Administration.

NEW YORK CITY-RAND INSTITUTE, New York, NY (1973-1975). Statistical analysis of crime data. As part of research into police operations, analyzed robberies and purse snatchings including organization of the data coding, data analysis, formulation of conclusions, and creation of methods for police use. Performed research on exploratory methods for multivariate point processes.

RAYTHEON, SUBMARINE SIGNAL DIVISION, Portsmouth, RI (1965-1973). Development of signal processing methods. As part of sonar system development, worked on problems in time series analysis, statistical inference, underwater sound propagation, and computer processing. Performed research on exploratory methods for multiple time series.

EDUCATION

Rensselaer Polytechnic Institute, B.S. Physics 1961, Ph.D. Mathematics 1967.

PROFESSIONAL SOCIETIES

American Statistical Association (Chair of the Committee on Statistics and the Environment, 1986)
Institute of Mathematical Statistics
Society for Industrial and Applied Mathematics (SIAM Institute for Mathematics and Society transplant, 1973-1975)