

JULY 27, 1995

MEMORANDUM TO: John T. Greeves, Director  
Division of Waste Management, NMSS

FROM: Michael J. Bell, Chief  
Engineering and Geosciences Branch  
Division of Waste Management, NMSS

SUBJECT: TRIP REPORT - NAS COMMITTEE MEETING TO REVIEW SURFACE PROCESS  
TECHNICAL BASIS REPORT, LAS VEGAS, NV, 7/19 & 7/20/95

On July 19 and 20, I attended and made a presentation at the first meeting of the Committee for Yucca Mountain Peer Review: Surface Characteristics, Preclosure Hydrology, and Erosion. This Committee is the first of six that will be established to review various aspects of the Yucca Mountain Program leading up to a U.S. Department of Energy (DOE) decision on site suitability. A copy of the agenda for the meeting (Attachment 1), the membership of the Committee (Attachment 2), and the Statement of Task (Attachment 3) for the review are attached for your information.

The initial presentation was made by Jane Summerson of DOE, who gave an overview of the development of Technical Basis Reports (TBR) and the Committee's Task (Attachment 4). I followed this with a description of the U.S. Nuclear Regulatory Commission's role and interests in the national High-Level Waste (HLW) program and a discussion of NRC's review of the DOE Topical Report on Extreme Erosion, erosion being one of the three technical areas covered by the TBR. Copies of the overhead for my presentation are attached (Attachment 5). The Committee had a great deal of interest in NRC's comments on the DOE Topical Report regarding the use of the Varnish Cation Ratio dating method used by DOE to estimate erosion rates of hillslope boulder deposits.

Presentations were also made by the State of Nevada, Clark County; the U.S. Geological Survey; and Dr. Leon Reiter, representing the Nuclear Waste Technical Review Board. A copy of Dr. Reiter's statement is attached (Attachment 6). There were also several opportunities during the meeting for members of the public to comment on the matters being considered by the Committee.

The next activity of the Committee will be a 2½-day field trip and open meeting on August 27-29. A copy of the draft agenda for the next meeting/field trip is attached (Attachment 7). Based on discussions at the meeting, the Committee plans to complete its work and publish a report on its review by early December 1995.

Attachments: As stated

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**NATIONAL RESEARCH COUNCIL**  
**COMMISSION ON GEOSCIENCES, ENVIRONMENT, AND RESOURCES**

2101 Constitution Avenue Washington, D.C. 20418

**BOARD ON**  
**RADIOACTIVE WASTE MANAGEMENT**  
(202) 334-3066 Fax: 334-3077

Office Location:  
Milton Harris Building  
Room 456  
2001 Wisconsin Avenue, N.W. 20007

**AGENDA**

**COMMITTEE FOR YUCCA MOUNTAIN PEER REVIEW:  
SURFACE CHARACTERISTICS, PRECLOSURE HYDROLOGY, AND EROSION**

Holiday Inn Crowne Plaza  
4255 South Paradise Road  
Las Vegas, Nevada 89109  
Ballroom

Meeting #1  
July 19-21, 1995

Wednesday, July 19, 1995

**OPEN SESSION**

8:30 - 8:45 am

**Welcome and Introductions**  
*Ernest T. Smerdon, Chair*  
*Kevin D. Crowley, Study Director*

- Purpose of and plan for the meeting
- Introduction of committee members and staff

8:45 - 9:30 am

**Project Background; National Academy of  
Sciences Procedures and Policies**  
*Ernest T. Smerdon, Chair*  
*Kevin D. Crowley, Study Director*

- Charge to the committee
- Review of the National Academy of Sciences/  
National Research Council study process
- General operating procedures for this project
- Project schedule
- Policies regarding public access and  
confidentiality
- Policies regarding audio and video recording
- Policies regarding public input at the meeting

- 9:30 - 10:30 am      **Development of Technical Basis Reports  
and the Committee's Task**  
*Jane Summerson, Department of Energy/Yucca  
Mountain Site Characterization Office*
- 10:30 - 11:00 am      **BREAK**
- 11:00 - 11:45 am      **U.S. Nuclear Regulatory Commission  
Perspectives on the Technical Basis Report**  
*Mike Bell, U.S. NRC*
- 11:45 - 12:00 pm      **Questions and Discussion**  
*Committee and Presenters*
- 12:00 - 1:30 pm      **LUNCH**
- 1:30 - 2:00 pm      **State of Nevada Perspectives on the  
Technical Basis Report**  
*Carl Johnson, Nevada Nuclear Waste Project Office*
- 2:00 - 2:30 pm      **Public Trust and the Nuclear Waste Program**  
*Judy Treichel, Nevada Nuclear Waste Task Force, Inc.*
- 2:30 - 3:30 pm      **Presentations by other Affected Units  
of Government**  
*TBD*
- 3:30 - 4:00 pm      **BREAK**
- 4:00 - 5:30 pm      **Opportunity for Public Comment**

Thursday, July 20, 1995

**OPEN SESSION**

- 8:30 - 8:40 am      **Summary of yesterday's activities and plan  
for the day**  
*Ernest T. Smerdon, Chair*
- 8:40 - 9:30 am      **U.S. Geological Survey Perspectives on the  
Technical Basis Report**  
*John Stuckless, Yucca Mountain Project  
Branch, USGS*

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|------------------|---|
| 9:30 - 9:45 am   | <b>Nuclear Waste Technical Review Board<br/>Perspectives on the Technical Basis<br/>Report</b><br><i>Leon Reiter, NWTRB</i> |
| 9:45 - 10:15 am  | <b>Discussion</b><br><i>Committee and Presenters</i>  |
| 10:15 - 10:45 am | <b>BREAK</b>  |
| 10:45 - 12:00 pm | <b>Additional Presentations by Affected Units<br/>of Government and Opportunity for Public<br/>Comment</b><br><i>TBD</i>    |
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Friday, July 21, 1995

**EXECUTIVE SESSION**

Attendance at this session is limited to NAS/NRC committee and staff members.

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*Jane Summerson, Department of Energy/Yucca  
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*Mike Bell, U.S. NRC*
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**Committee for Yucca Mountain Peer Review:  
Surface Characteristics, Preclosure Hydrology, and Erosion**

**Committee Roster**

**Ernest T. Smerdon, Chair**  
University of Arizona  
Tucson, AZ  
*Hydrology Agr Engr, Dean of Engr*

**Mark D. Kurz**  
Woods Hole Oceanographic Institution  
Woods Hole, MA  
*Geochronology Quaternary Geology  
Coastal Geology*

**Jean M. Bahr, Vice-Chair**  
University of Wisconsin  
Madison, WI  
*Hydrogeology on Yucca Mtn Stud Panel  
member BRWM*

**Leonard J. Lane**  
Agricultural Research Service/USDA  
Tucson, AZ  
*Geomorphology NE / Systems Engr*

**Victor R. Baker**  
University of Arizona  
Tucson, AZ  
*Geomorphology and Surface Water  
Hydrology Visiting Professor north, etc.*

**Karen L. Prestegard**  
University of Maryland  
College Park, MD  
*Surface Water Hydrology Erosion + Sedimentation*

**Susan L. Brantley**  
Pennsylvania State University  
University Park, PA  
*Geochemistry Director  
aqueous geochemistry*

**NRC Staff:**  
Kevin D. Crowley, Study Director  
Carl A. Anderson, BRWM Director  
Rebecca Burka, Senior Project Assistant  
Scott A. Hassell, Intern

**William A. Jury**  
University of California  
Riverside, CA  
*Soils and Unsaturated Zone Hydrology  
Soil Scientist*

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**Yucca Mountain Peer Review Committee**

Office Location:  
Milton Harris Building  
Room 456  
2001 Wisconsin Avenue, N.W. 20007

**Statement of Task**

The committee will perform a scientific and technical review of the April 1995 Yucca Mountain Site Characterization Project *Technical Basis Report for Surface Characteristics, Preclosure Hydrology, and Erosion*.

The committee will evaluate this report to assess the validity of the data and interpretations and the adequacy of the treatment of uncertainties in describing the current state of understanding. The committee will review only the technical and scientific analyses. The committee will not address regulatory compliance, nor will it address the suitability of the Yucca Mountain site as a high-level radioactive waste repository. The committee will prepare a written report of its findings for distribution to OCRWM and interested members of the public.

The review will address (but will not be limited to) the following questions:

- a. Have the data been collected and analyzed in a technically acceptable manner?
- b. Do the data, given the associated error and analytical and technical uncertainties, support the technical interpretations and conclusions made within the technical basis report?
- c. Are there credible alternative interpretations that would significantly alter the conclusions reached?
- d. What testing, if any, would discriminate among alternative technical interpretations?
- e. If such testing is recommended, how effective would it be at reducing significant uncertainties?

The committee will attempt to distinguish between recommendations for further technical work to reduce uncertainty, and any recommendations pertaining to DOE policy or management.

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YUCCA  
MOUNTAIN  
PROJECT

Studies

# Development of Technical Basis Reports and The Committee's Task

Presented to:

National Academy of Sciences - National Research Council  
Board on Radioactive Waste Management

Presented by:

Dr. Jane Summerson

July 19, 1995



U.S. Department of Energy  
Office of Civilian Radioactive  
Waste Management

# Introduction

- **DOE sees the National Academy of Sciences peer review process as fundamental to our efforts to focus on evaluating the technical work of the program in support of the policy and management decisions DOE must make.**
- **Discussion:**
  - **Program Plan Context;**
  - **Suitability Evaluation Process Context; and**
  - **Surface Characteristics, Preclosure Hydrology, and Erosion Technical Basis Report Peer Review.**

# Program Plan

- **The Nuclear Waste Policy Act of 1982 (NWPA), and its 1987 Amendment, directed DOE to site, construct, and operate geologic repositories for the disposal of high-level radioactive waste and spent nuclear fuel.**

# Program Plan

(Continued)

- **DOE must complete four major actions for repository development:**
  - **Identify under DOE's 10 CFR Part 960 a suitable site for eventual development as a repository:**
    - » **Conduct evaluations leading to higher-level findings on individual 10 CFR Part 960 guideline conditions;**
    - » **Evaluate technical site suitability; and**
    - » **Evaluate overall site suitability using additional information developed during the National Environmental Policy Act (NEPA) process;**
  - **Comply with the provisions of the NEPA under 10 CFR Part 1021;**
  - **For a suitable site, submit a Site Recommendation Report to the President;**
  - **Develop a License Application for submittal to the NRC for a construction authorization under 10 CFR Part 60 and 10 CFR Part 51.**

# Site Investigations

- **DOE's Site Characterization Plan (1988) called for extensive testing to obtain a comprehensive understanding of the Yucca Mountain Site to address both DOE's 10 CFR Part 960 and NRC's 10 CFR Part 60.**
- **National Academy of Sciences (NAS), in its 1990 report "Rethinking High-Level Waste," stressed that it is not practical to assume that all information would be available prior to constructing a repository; OCRWM's Program Plan (1994) is consistent with the NAS position.**
- **OCRWM's Site Suitability Evaluation Process (Process) is based on incremental technical evaluations performed as site data and analyses become available, and will assess whether or not applicable 10 CFR Part 960 Siting Guideline conditions are satisfied.**

# Site Suitability and Licensing

- **A single technical program for acquisition of site data and analyses supports:**
  - **Technical basis reports used to support site suitability evaluations;**
  - **The License Application Annotated Outline (AO) that addresses demonstrations of compliance with the requirements of 10 CFR Part 60;**
  - **The NEPA process and its documents.**
- **An effective organization is in place to ensure that information from site characterization, design, and performance assessment activities is available to support suitability and licensing needs without duplication of effort.**

# Site Suitability Evaluation Process Structure

- **The site suitability process has three key elements:**
  - **Development and independent peer review of technical basis reports;**
  - **Development and public review of assessments of compliance with the 10 CFR Part 960 Siting Guidelines;**
  - **Sequential DOE Higher-Level Findings (HLFs), and evaluations of technical site suitability and overall site suitability. The series of technical basis reports, peer reviews, and guideline compliance assessments will support these decisions.**

# Higher-Level Findings

- **A higher-level suitability finding may be made:**
  - **If the available evidence supports a conclusion that:**
    - » **A disqualifying condition is not present, and additional information is unlikely to change the conclusion;**
    - » **A qualifying condition is present, and additional information is unlikely to change the conclusion.**
- **A higher-level finding means that additional data are unlikely to change current conclusions about the suitability of the site.**

# Technical Basis Reports

- **Technical Basis Reports (TBRs) present the information required to support evaluations of the site against the relevant qualifying and disqualifying conditions of DOE's 10 CFR Part 960 Siting Guidelines.**
- **TBRs contain the information upon which the regulatory conclusions in Guideline Compliance Assessments (GCAs) will be based, but do not constitute a demonstration of compliance with any regulation.**
- **Each TBR will:**
  - **Summarize available data, analyses, and technical interpretations;**
  - **Present a synthesis of the current understanding of technical topics;**
  - **Evaluate uncertainties, alternative models and hypotheses permitted by the data;**
  - **Establish reasonably conservative bounds on conditions and processes consistent with the current understanding.**

# Peer Review

- **Each TBR will undergo external peer review managed by the NAS/National Research Council Board on Radioactive Waste Management (BRWM).**
- **NAS/BRWM managed peer reviews will:**
  - **Provide an independent evaluation of the quality of DOE's technical work;**
  - **Aid in increasing scientific confidence; and**
  - **Improve public trust and confidence in DOE's technical work.**
- **DOE's Site Suitability Evaluation Process purposely separates scientific analyses from DOE's evaluation of compliance with the guidelines in order to facilitate a purely technical peer review.**

# **Guideline Compliance Assessments**

- **Before DOE can find the Yucca Mountain Site suitable for repository development, adequate evidence must be developed to support positive higher-level findings for the qualifying and disqualifying conditions in DOE's 10 CFR Part 960 Siting Guidelines. Each TBR is intended to support GCA regulatory analyses.**
- **GCAs will be DOE staff analyses of compliance. They will be issued in draft form for public review and comment prior to any regulatory decisions by the OCRWM Director.**

# **Surface Characteristics, Preclosure Hydrology, and Erosion TBR**

- **This Technical Basis Report presents a synthesis of information and interpretations relevant to providing the technical basis to evaluate three technical guidelines from 10 CFR Part 960 regarding the surface characteristics, preclosure hydrology, and erosion at the Yucca Mountain Site.**
- **Data provided in the report was collected in studies identified in DOE's Site Characterization Plan (SCP).**

# Surface Characteristics, Preclosure Hydrology, and Erosion TBR

(Continued)

- **Primary TBR sources include:**
  - **Environmental Assessment (DOE, 1986), the SCP (DOE, 1988), the Early Site Suitability Evaluation (Younker et al, 1993) and the Topical Report on Extreme Erosion (DOE, 1993).**
- **This report uses material from these reports and more recent work in the relevant areas of interest:**
  - **References for additional technical reports are listed in the TBR.**
- **DOE evaluated other available information for relevancy.**

# Surface Characteristics, Preclosure Hydrology, and Erosion TBR

(Continued)

- The TBR underwent a comprehensive programmatic, policy, QA, and patent review, in addition to a thorough technical review. Project participants involved with the technical review included:
  - DOE/Yucca Mountain Site Characterization Office (Scientific Programs; Environment, Safety, and Health; Suitability and Licensing; Engineering and Field Operations; and DOE Headquarters);
  - CRWMS M&O (TRW, WCFS, Lawrence Livermore, Los Alamos, Sandia National Laboratories);
  - U.S. Geological Survey.
- All comments were resolved prior to TBR finalization and submission to the NAS.

# **Surface Characteristics, Preclosure Hydrology, and Erosion TBR**

**(Continued)**

- **For Surface Characteristics, the TBR discusses:**
  - **Surficial geology and topography (surface drainage) of the Yucca Mountain Site.**
- **For Preclosure Hydrology, the TBR discusses:**
  - **Perched water on or near the repository block;**
  - **Location of facilities and analyses of probable maximum flood (PMF);**
  - **Estimated water use for the project and adequacy of the water supply impact on water-level elevations.**

# **Surface Characteristics, Preclosure Hydrology, and Erosion TBR**

(Continued)

- **For Erosion, the TBR discusses:**
  - **Surficial geology and topography;**
  - **Rates of erosional processes in the Yucca Mountain area during the past several hundred thousand years;**
  - **Potential for breaching of the repository by erosion.**

# DOE Expectations

- **DOE expects that the NAS reviewers will evaluate the adequacy of the data, validity of the interpretations, and treatment of uncertainties presented in the TBRs. NAS reviewers have been asked to address the following questions, as appropriate:**
  - **Have the data been collected and analyzed in a technically acceptable manner?**
  - **Does the data, given the associated error and analytical and conceptual uncertainties, support the technical interpretations and conclusions made within the report?**
  - **Are there credible alternative interpretations that would significantly alter the conclusions reached?**
  - **What testing, if any, would discriminate among alternative technical interpretations?**
  - **If such testing is recommended, how effective would it be at reducing significant uncertainties?**

# Summary

- **The Surface Characteristics, Preclosure Hydrology, and Erosion Technical Basis Report:**
  - Presents a synthesis of information and interpretations that is the technical basis DOE will use to evaluate three technical guidelines from 10 CFR Part 960;
  - Supports regulatory analyses referred to as GCAs. GCAs will be DOE staff analyses and recommendations on compliance. They will be issued in draft form for public review and comment prior to any regulatory decisions by the OCRWM Director.
- **The National Academy of Sciences peer review process is fundamental to DOE's efforts to focus on evaluating the technical work of the program which forms the basis of the policy and management decisions DOE must make.**

**NRC STAFF REVIEW OF DOE TOPICAL REPORT  
ON EXTREME EROSION**

**PRESENTATION TO NATIONAL RESEARCH  
COUNCIL COMMITTEE FOR YUCCA MOUNTAIN  
PEER REVIEW: SURFACE CHARACTERISTICS,  
PRECLOSURE HYDROLOGY AND EROSION**

**July 19, 1995**

**Michael J. Bell  
United States Nuclear Regulatory Commission  
Office of Nuclear Material Safety and Safeguards  
Division of Waste Management**

# **FEDERAL AGENCY ROLES**

## **DOE IS THE DEVELOPER**

- **Determines Site Suitability**
- **Design**
- **Construction**
- **Operation**

## **NRC IS THE REGULATOR**

- **Protect Public Health and Safety and Environment**
- **Regulations Published in 10 CFR Part 60**

# **SITE CHARACTERIZATION**

- **COLLECT DATA TO DETERMINE SITE SUITABILITY**
  - **Process NAS Involved In**
- **COLLECT DATA TO PREPARE LICENSE APPLICATION**
  - **NRC's Focus**
- **MANY COMMON ISSUES AND INFORMATION NEEDS**

## **DOE SITING GUIDELINES (10 CFR 960)**

- **SITING GUIDELINES HAVE QUALIFYING AND DISQUALIFYING CONDITIONS**
  - **DOE must make a positive finding that site is qualified, or it is disqualified**

# **NRC SITING REQUIREMENTS (10 CFR PART 60)**

- **NRC regulations have favorable and potentially adverse conditions that must be evaluated in the context of the overall system**
  - **a potentially adverse condition can be compensated by favorable conditions or by engineering**
  - **evidence of extreme erosion is a potentially adverse condition in 10 CFR Part 60**
  - **NRC has been reviewing a DOE topical report on this topic**

# **TECHNICAL BASIS REPORT**

- **COVERS THREE TOPICS**
  - **Surface Characteristics**
  - **Pre-closure Hydrology**
  - **Erosion**
  
- **NRC WILL ONLY ADDRESS EROSION FROM THE PERSPECTIVE OF ITS REVIEW OF DOE'S TOPICAL REPORT**
  - **Still in progress**

## **EXTREME EROSION IN PART 60**

- **60.122 (c) Potentially Adverse Conditions.** The following conditions are potentially adverse conditions if they are characteristic of the controlled area or may affect isolation within the controlled area.

•  
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**(16) Evidence of extreme erosion during the Quaternary Period**

•  
•

## **NRC CONCERNS**

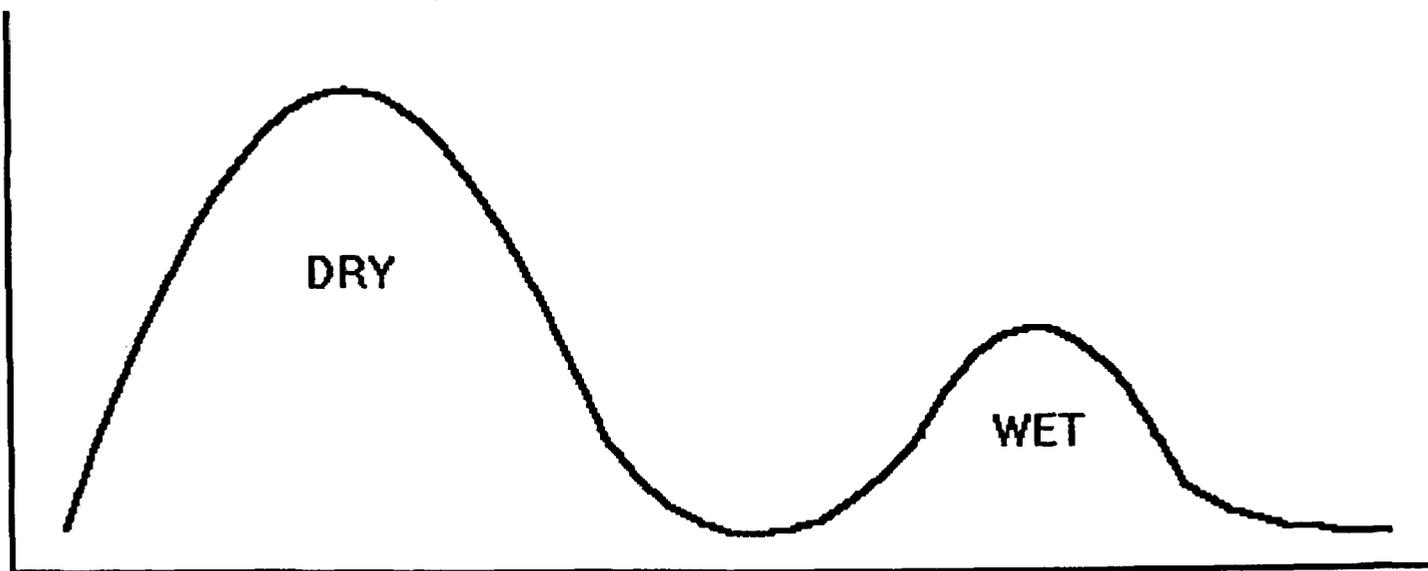
- **STAFF CONCERN WITH THE SCOPE OF THE TOPICAL REPORT**
- **ADEQUACY OF THE DATING METHOD NOT DEMONSTRATED**
- **DEFICIENCIES IN THE DATA QUALIFICATION PROCESS**

## **STAFF CONCERN WITH THE SCOPE OF THE TOPICAL REPORT**

- **REGULATORY REQUIREMENTS RELATED TO EXTREME EROSION HAVE NOT BEEN MET**
- **TOPICAL REPORT FOCUSES ON DENUDATION RATHER THAN EXTREME EROSION**
- **DENUDATION" DEFINED AS THE WEARING DOWN OF THE EARTH'S SURFACE SIMULTANEOUSLY BY VARIOUS NATURAL PROCESSES, ONLY ONE OF WHICH IS EROSION**
- **TOPICAL REPORT DESCRIBES DENUDATION RATES AVERAGED OVER LONG PERIODS OF TIME ENCOMPASSING SEVERAL, PROBABLY MANY, CYCLES OF HILLSLOPE AGGRADATION AND DEGRADATION (EROSION)**

- **THE TERM "EXTREME EROSION" DEFINED IN NUREG-0804 (p. 382) AS "SUBSTANTIAL CHANGES IN LAND FORMS (AS A RESULT OF EROSION) OVER RELATIVELY SHORT PERIODS OF TIME**
- **RELATIVELY SHORT PERIODS OF TIME CONSIDERED EQUIVALENT TO "RELEVANT TIME PERIOD" AS DESCRIBED IN NRC'S TECHNICAL CRITERIA**
- **SCA COMMENT 43 OF 1989 INDICATES THAT AVERAGED LONG-TERM RATES OF EROSION ARE NOT CONSERVATIVE WHEN APPLIED TO SHORTER PERIODS SUCH AS THE PERIOD OF PERFORMANCE OF THE REPOSITORY**
- **DOE'S DENUDATION (DEGRADATION) RATES BASED ON AVERAGES OF TIME FRAMES RANGING FROM 170,000 TO 1.38 MILLION YEARS**
- **THESE RATES ARE NOT APPROPRIATE FOR PERIOD OF PERFORMANCE CONSIDERATIONS**

FREQUENCY OF  
OCCURRENCE



EROSION RATE

**ADEQUACY OF THE DATING METHOD NOT  
DEMONSTRATED**

## **ROCK VARNISH DATING METHOD**

- **RELIANCE ON THE VARNISH CATION RATIO DATING METHOD (VCR) ALONE TO ESTABLISH THE AGE OF GEOMORPHIC SURFACES (BOULDER DEPOSITS) IS INADEQUATE FOR DEMONSTRATING THE ABSENCE OF EXTREME EROSION**
- **ADDITIONAL METHODS ARE NEEDED TO DETERMINE THE AGE OF EXPOSURE OF SURFACES TO PROVIDE REASONABLE ASSURANCE WITH REGARD TO THE FINDINGS OF THE STUDY ON EXTREME EROSION.**
- **THE VCR DATING METHOD HAS RECEIVED CONSIDERABLE ATTENTION SINCE IT WAS FIRST PROPOSED AND DEVELOPED BY RONALD DORN IN 1983.**

- **DESPITE A CONSIDERABLE AMOUNT OF WORK ON THE PHYSICAL AND CHEMICAL PROPERTIES OF DESERT VARNISH, THE EXACT REASONS FOR APPARENT VARIATIONS IN THE RATIO OF POTASSIUM AND CALCIUM TO TITANIUM (KCT) REMAIN OBSCURE.**
- **VARIOUS ALTERNATIVE HYPOTHESES INDICATE THAT THE VARIATIONS IN KCT RATIOS VARIATIONS MAY BE TIME INDEPENDENT AND ATTRIBUTABLE TO: (1) DIFFERENT DEGREES OF SUBSTRATE CONTAMINATION, (2) AMOUNT OR COMPOSITION OF THE UNDERLYING SUBSTRATE, (3) COMPOSITION OF DEUTERIC MINERALS, OR (4) TEXTURAL VARIATIONS.**
- **THESE HYPOTHESES NEED TO BE TESTED BEFORE THE VCR DATING TECHNIQUE CAN BE USED TO ESTABLISH AGES OF GEOMORPHIC SURFACES.**

## **ADDITIONAL STAFF CONCERNS RELATED TO THE ROCK VARNISH DATING METHOD**

- **POINTS ON THE CALIBRATION CURVE USE MATERIAL DATED BY THE URANIUM-TREND (U-TREND) METHOD AND THE K-AR METHOD**
- **THE U-TREND METHOD IS USED TO DETERMINE THE AGE OF COARSE-GRAINED ALLUVIAL DEPOSITS**
- **THREE OF THE FIVE POINTS ON THE CALIBRATION CURVE USE THE U-TREND METHOD**
- **THESE SAME POINTS WERE USED BY SWADLEY ET AL. (1984) TO ESTIMATE THE AGES OF QUATERNARY SOILS AND ALLUVIAL DEPOSITS IN THE VICINITY OF YUCCA MOUNTAIN**

- **SWADLEY ET AL. (1984) NOTED THAT THE DATING TECHNIQUE WAS EXPERIMENTAL AND "THAT THE ACCURACY OF THE ABSOLUTE AGES DERIVED BY THIS METHOD IS NOT KNOWN. . ."**
- **GEYH AND SCHLEICHER (1990) ALSO QUESTION WHETHER U-TREND DATES ACTUALLY REPRESENT THE AGE OF THE DEPOSIT**
- **NO DATA HAVE BEEN PRESENTED IN THE TOPICAL REPORT TO DEMONSTRATE THAT THE U-TREND DATES USED IN THE CALIBRATION CURVE EITHER PRECISELY OR ACCURATELY REPRESENT THE AGE OF THE DEPOSIT OR OF THE VARNISH ASSOCIATED WITH THESE DEPOSITS**
- **THE LOS ALAMOS 1989 PEER REVIEW REPORT RECOMMENDED THAT ADDITIONAL POINTS BE ADDED TO THE CALIBRATION CURVE BY ALL SUITABLE METHODS**

- **THE CALIBRATION CURVE USED IN THE TOPICAL REPORT APPARENTLY HAS NOT BEEN MODIFIED OR TESTED IN ANY WAY SINCE IT WAS ORIGINALLY PUBLISHED BY HARRINGTON AND WHITNEY IN 1987**
- **IF U-TREND DATES ARE TO BE USED IN THE CALIBRATION CURVE, THEN APPARENT AMBIGUITIES BETWEEN U-TREND DATES USED IN THE TOPICAL REPORT AND THOSE IN ROSHOLT ET AL. (1985) MUST BE ADDRESSED**

## **DEFICIENCIES IN THE DATA QUALIFICATION PROCESS**

- **DOCUMENTATION OF ACTIVITIES AFFECTING QUALITY  
REQUIRED BY NRC**
- **DOE REQUIRES IMPLEMENTATION OF A PROGRAM TO MEET  
NRC REQUIREMENTS**
- **LOS ALAMOS QUALITY REQUIREMENTS MUST ALSO MEET  
NRC'S REQUIREMENTS**
- **RECOMMENDATIONS OF THE 1989 PEER REVIEW REPORT  
REGARDING THE VARNISH CATION RATIO (VCR) METHOD  
APPARENTLY NOT ADDRESSED**
- **NRC HAS SIMILAR CONCERNS ABOUT VCR METHOD**

- **CHARTER OF DOE'S 1992 TECHNICAL ASSESSMENT TEAM APPARENTLY DID NOT INCLUDE ADDRESSING PEER REVIEW GROUP RECOMMENDATIONS**
- **VCR CALIBRATION CURVE REMAINS UNCHANGED SINCE ORIGINALLY PUBLISHED IN 1987**
- **PARTIALLY AS A RESULT OF NOT FOLLOWING THROUGH WITH THE PEER REVIEW REPORT RECOMMENDATIONS THE VCR TECHNIQUE IS UNSUITABLE FOR ITS INTENDED USE**

## **PRESENT STATUS**

- **DOE IS COLLECTING CORROBORATING DATA USING THE BE-10 METHOD TO DATE CERTAIN BOULDER DEPOSITS**
- **DOE EXPECTS TO SUBMIT CORROBORATING DATA BY SEPTEMBER '95**
- **CONSIDERABLE UNCERTAINTY IN EROSION RATES CAN BE TOLERATED AND NOT ADVERSELY AFFECT PERFORMANCE**

**COMMENTS TO THE NAS YUCCA MOUNTAIN PEER REVIEW PANEL ON  
SURFACE PROCESSES**

**Leon Reiter  
Senior Professional Staff  
U.S. Nuclear Waste Technical Review Board**

**Good morning. My name is Leon Reiter and I am a member of the senior professional staff of the U.S. Nuclear Waste Technical Review Board. The NWTRB was set up by Congress in the 1987 amendments to the Nuclear Waste Policy Act. The Board's charge is to review the technical and scientific validity of activities undertaken by the Department of Energy related to the management and disposal of spent nuclear fuel and some defense high-level radioactive waste. The primary, but certainly not exclusive, focus of the Board has been the technical activities related to the DOE's site-characterization program at Yucca Mountain, Nevada, the goal of which is to determine if that site is suitable as a location for a permanent underground high-level waste repository. We conduct our business through full Board meetings, smaller panel meetings, field trips, and informal contact with the scientists and engineers working on or interested in the DOE's waste management program. We have often testified before Congress on the nuclear waste program.**

**Our Board members are chosen by the President from a slate of nominees provided by the National Academy of Sciences. They work part time on Board business and cover a wide range of disciplines from geochemistry to geoengineering and from materials science to ecology. At full strength, the Board has 11 members supported by a 10 person professional staff. Dr. John Cantlon, a former vice president for research and graduate studies at Michigan State University, is our chairman. I have brought along copies of our most recent report and newsletter so that you may get a better idea of who we are and what we do.**

**Over the years we have provided, through our reports and letters to Congress and the Secretary of Energy, many recommendations that we believe serve to enhance the quality and effectiveness of the high-level waste program. Among the important things we have emphasized are the need to conduct underground investigations as soon as possible, the importance of thermal effects on the repository, the desirability of robust waste packages, and the need to develop a clear and coherent waste isolation strategy for a repository in the unsaturated zone at Yucca Mountain.**

**The Board has often urged the DOE to seek detailed outside expert advice on its program. We welcome the National Academy of Sciences peer review process by which groups of highly qualified scientists will be examining different aspects of the DOE's characterization of the Yucca Mountain site. We have been asked to acquaint each peer review panel with those evaluations and recommendations made by the Board within the panel's area of interest. The amount of discussion the Board has devoted to specific subjects varies greatly. Topics such as hydrogeology, tectonics, geoengineering, geochemistry, and risk analysis have been addressed often. Surface characteristics,**

preclosure hydrology, and erosion have not. In fact, the only reference we make to any of these surface processes is in our March 1995 report. We took issue with the DOE strategy as expressed in a 1994 topical report on extreme erosion. In our eyes too much emphasis was placed on a controversial dating technique and not enough emphasis was placed on other available evidence.

We are sure you will be drawing your own conclusions on this and the other topics you are charged with looking at.

The Board wishes you the best of luck. As you are well aware, you are entering an important and highly controversial arena. We will be following your public deliberations and looking forward to your final report.

*Committee for Yucca Mountain Peer Review:  
Surface Characteristics, Preclosure Hydrology, and Erosion  
Meeting #2 Field Trip  
August 27-29, 1995*

**DRAFT 2**

**Note on Written Materials:** The committee welcomes written materials from DOE or State scientists to illuminate/elucidate the issues that will be discussed during the open session and field trip. The committee requests 15 copies of all written materials, preferably with a standard 3-hole punch in the left margin.

Sunday, August 27

7:00 am Field trip participants will depart for Beatty from the La Quinta Inn located at 3970 Paradise Road in Las Vegas (phone: 702-796-9000). NAS committee/staff will travel in a separate vehicle.

**Stop 1: U.S Route 95 at Fortymile Wash.** Erosional history of Fortymile Wash and historical flooding [DOE: Whitney, Lundstrom and a USGS scientist; State: Mifflin]. One hour.

**Stop 2: Lathrop Wells Cone.** Comparison of dating techniques; techniques to infer erosion. [DOE and State: Scientists familiar with field relationships and dating]. One hour.

12:00 pm Arrive at Beatty, Nevada.

2:00-6:00 Public Session at Beatty Community Center

2:00-4:00 **Committee Discussion on Hydrology.** DOE scientists should bring overheads and other materials and should be prepared for a question and answer exchange with the committee. The State may also wish to bring scientists to respond to questions. The committee does not want a formal presentation from the DOE or the State. The committee will ask questions on the following two topics:

**Perched water.** Nature, extent, occurrence, and flux rates; dating and other geochemical work; experimental design to find perched water; how well perched water is understood and can be predicted. [DOE: Luckey, Czarnecki, and another USGS scientist; State: Mifflin]

**Groundwater supply.** Given alternative conceptual models for steep hydrologic gradients north of Yucca Mountain, how do they affect predictions of drawdown of the groundwater table? [DOE: Luckey and Czarniecki; State: Mifflin]

**4:00-6:00 Committee Discussion and Public Comment**

**Monday, August 28**

- 6:00 am** Depart Beatty to Nevada Test Site Gate 510 for badging.
- 7:00** Depart Nevada Test Site Gate 510 for Stop 1.
- 8:00-11:00** **Stop 1: Big Skull Mountain Vista.** Erosional history, debris flows, and varnish dating. [DOE: Whitney and Harrington; State: Krinsley]
- Stop 2: LSM-1 Boulder Deposit.** Erosional history, debris flows, and varnish dating. [DOE: Whitney and Harrington; State: Krinsley]
- 11:00-12:00** Lunch (Site Characterization Office)
- 12:00-3:00** **Stop 3: Fortymile Wash Vista.** Drainage evolution, incision rates, and Quaternary history. [DOE: Whitney and Lundstrom; State: Spaulding]
- Stop 4: Jake Ridge.** Debris flows from a storm event. [DOE: Whitney and Coe(?); State: none]
- 3:00-4:00** **Stop 5: Trench 14D/Crest Exile Hill.** Surficial deposits and alluvium/colluvium relationships as evidence for erosion rates. Amounts of Quaternary faulting. [DOE: Lundstrom and Whitney; State: Bell]
- 4:00-5:30** **Stop 6: Yucca Crest.** Wrap-up and overview of tomorrow's work. [DOE: Whitney and Harrington; State: ?]
- 5:30** Depart for Beatty via Test Site Gate 510.

**Tuesday, August 29**

- 6:00 am      Committee will depart from Beatty.
- 6:45      Committee will meet DOE and State scientists at Steves Pass turnaround.
- 6:45      **Stop 1: Steves Pass. Overview of Crater Flats. [DOE: Whitney; State: Bell, Spaulding]**
- Stop 2: Crater Flats Cinder Cone. Erosional history. Not interested in recurrence rates of volcanic processes. [DOE: Harrington; State: Bell, Spaulding]**
- Stop 3: Trench 8. Boulder deposits, relationship of colluvium with hillslope deposits, erosion rates, and antiquity of colluvial deposits as determined from K-horizon carbonates. Not interested in history of faulting. [DOE: Whitney and Harrington; State: Bell]**
- Stop 4: SCFT-3. Boulder deposits, relationship of colluvium with hillslope deposits, erosion rates, and antiquity of colluvial deposits as determined from K-horizon carbonates. Not interested in history of faulting. [DOE: Whitney and Harrington; State: Bell]**
- 12:00 pm     Depart for Las Vegas.